



The Next 20 years: Challenges and Opportunities

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The Danger of Predictions

“I think there is a world market for maybe five computers.”

Thomas J. Watson, 1943, Chairman of IBM

“Computers in the future may weigh no more than 1.5 tons.”

Popular Mechanics, 1949

“640K of RAM ought to be enough for anybody.”

Bill Gates, 1981

A World of Challenges

- **Demographic Challenge**

In 2000 there were 5 European workers for every retired person

By 2050 that ratio will have fallen to 2 to 1

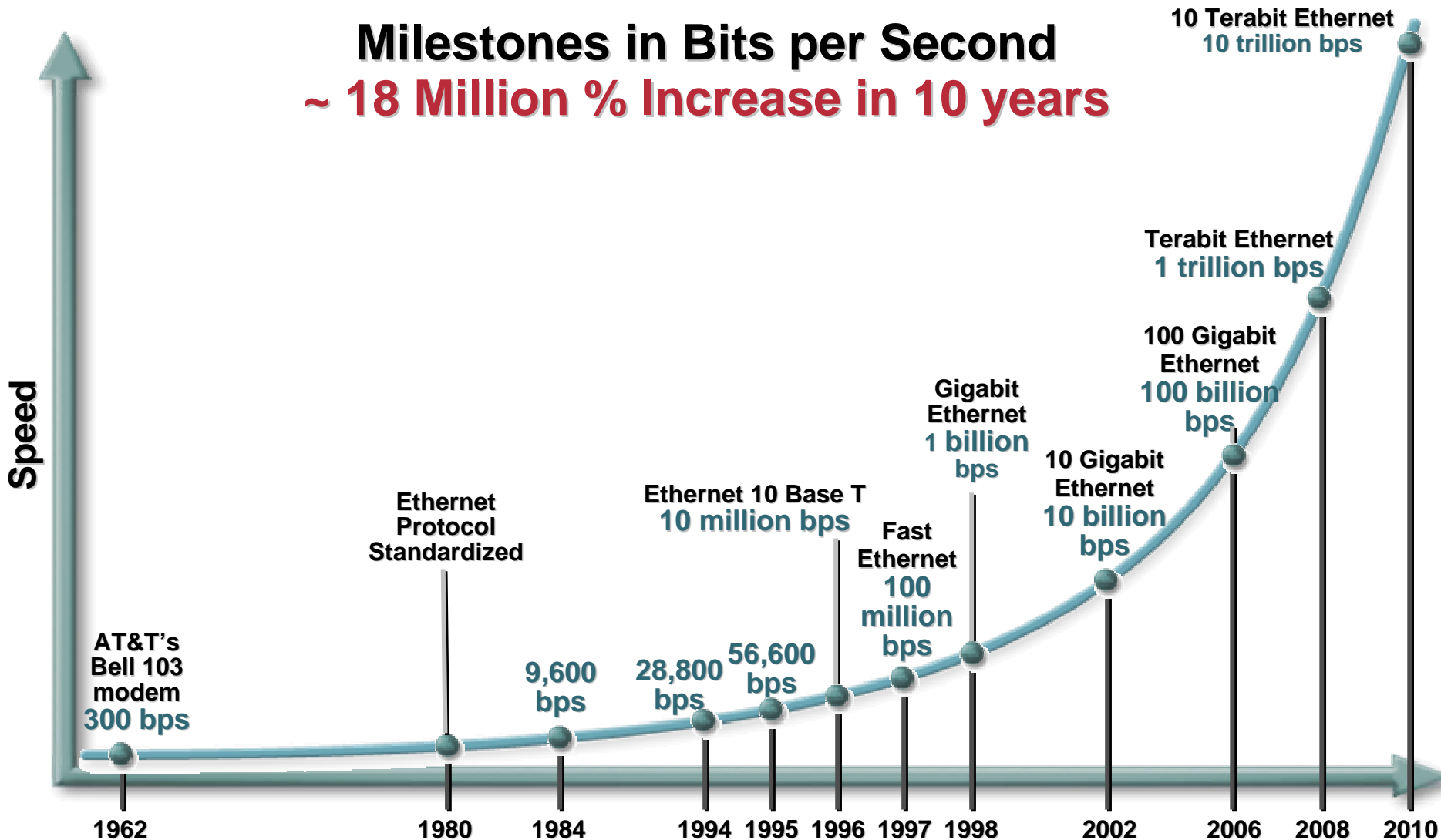
- **Competitiveness Challenge**

In 2005 BRIC countries had 15% of GDP of G6 nations

By 2025 ratio will reach 53%; by 2050 it will reach 155%

Explosion in Network Bandwidth

Milestones in Bits per Second
~ 18 Million % Increase in 10 years



Explosion in Data Creation

- It took 200 years to fill the U.S. Library of Congress with more than:
 - 29 million books and periodicals
 - 2.7 million recordings
 - 12 million photographs
 - 4.8 million maps, and
 - 57 million manuscripts.
- Today it takes about 15 minutes for the world to create a similar amount of digital information
- Extrapolate 10 years and information on global networks will double every 11 seconds.



Price/Performance Transformation

1956:

1 Megabyte = US\$65,000*



IBM RAMAC

2005: 2025:

700 Megabyte 600 Gigabytes = \$0.01*



25 pack = \$20800 CDs

630,000 times increase in storage at 6.5% annual increase in cost

*\$10,000 adjusted for inflation. Magnetic storage (CDs used for illustrative purposes)

What would this really mean?

**For \$100 you could have
6.3 petabytes of storage**



**King Joao V de Braganca
“ the Magnanimous”**

**Set up a Video
Camera in 1700
and recorded every
minute of every
day and still have
recording time left**

Price/Performance Transformation (2)

The human brain has raw computational power of 100 trillion operations per second and memory capacity of about 100 terabytes.



2050

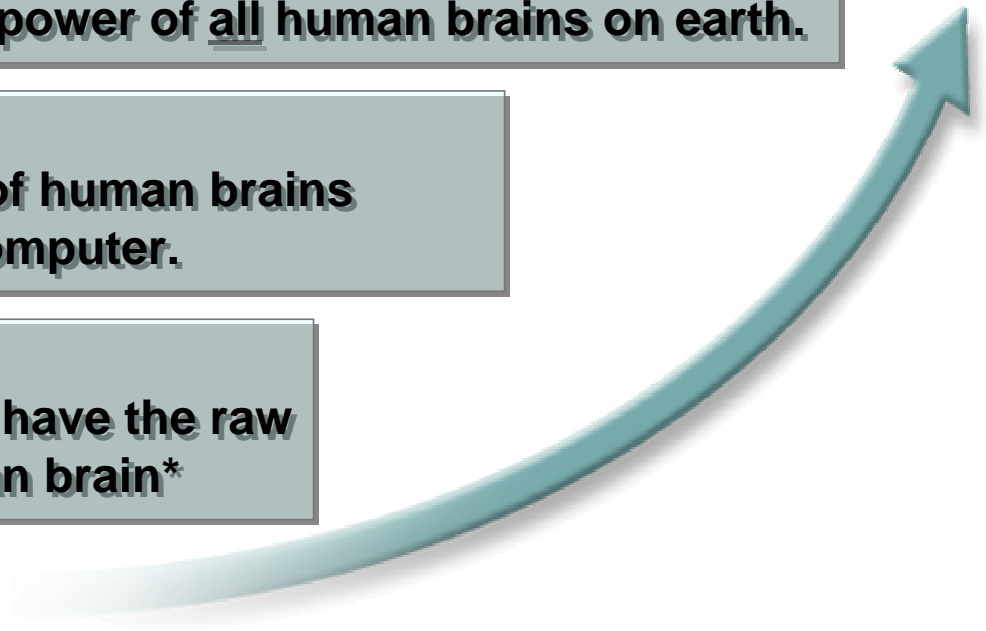
\$1,000 worth of computing will equal the processing power of all human brains on earth.

2030

It will take a village of human brains to match a \$1,000 computer.

2020

\$1,000 personal computer will have the raw processing power of the human brain*



Source: Hans Moravec, Robotics Institute, Carnegie Mellon University

It's Happening Now (1)

The Cisco Carrier Routing System (CRS-1)*

Scales to over 90 terabits per second of bandwidth capacity, enough to support:



- The entire global population on simultaneous voice-over-IP phone calls
- 1 billion people playing online games using real-time voice and chat
- 15 million people watching high-quality video-on-demand

* Certified by Guinness Book of World Records as the world's highest capacity Internet router.



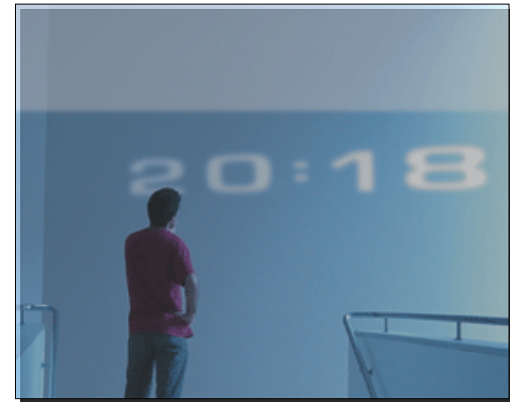
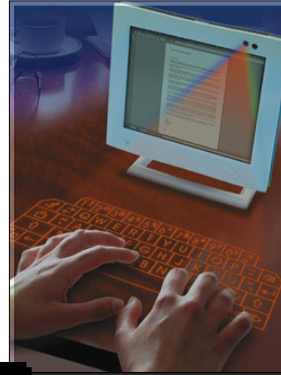
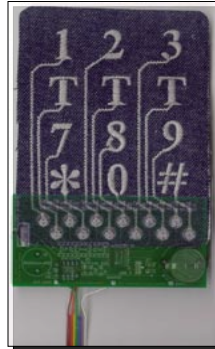
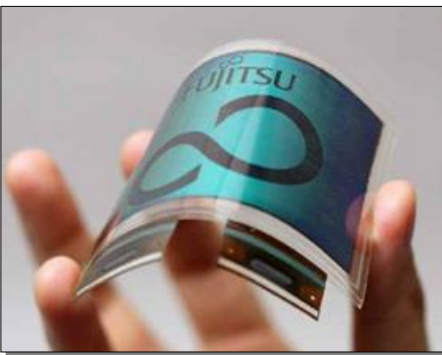
It's Happening Now (2)

- **“Cell” chip has been in joint development by Sony, Toshiba and IBM since 2001**
- **Multi-core, multi-threaded gaming engine able to process separate instructions in parallel**
- **First application: Sony Playstation, 2006**
 - **One 3.2GHz cell processor—total system performance rated at 2.18 teraflops**
 - **250 times faster than the fastest desktop computer.**
- **2% of the raw computing power of the human brain for about \$200**
- **1/20 speed of a supercomputer**



Source: PCWorld, February 2005

It's Happening Now (3)

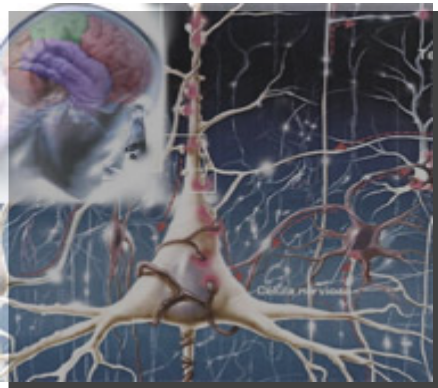
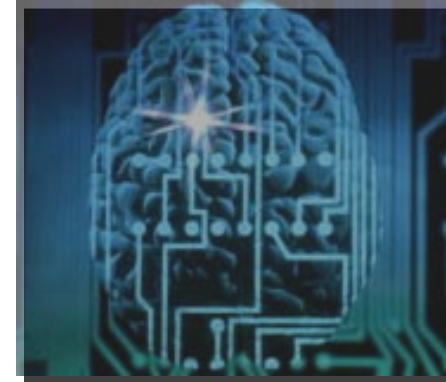


It's Happening Now (4)

The Ultimate Integration

October 2004

A 25-year-old quadriplegic connected to a computer plays the computer game Pong, just by using his thoughts, via 100 tiny sensors implanted in his brain.



April 2005

PlayStation maker Sony Corp. is granted a patent for beaming sensory information, such as smells, sounds and images, directly into the brain

Source: CNN, USA Today, KurzweilAI.net

Riding the Technology Avalanche

- **Education**

How well prepared will our children be?

- **Innovation**

How open is our society to change? How well does it encourage innovation?

- **Agility**

How radically are our businesses and public sector re-thinking their operating models? What level of change are they ready for?

CISCO SYSTEMS

