Dynamics of change
Exploring the possibilities for the Internet of the future

Darren Scott

Director, Internet Business Solutions Group

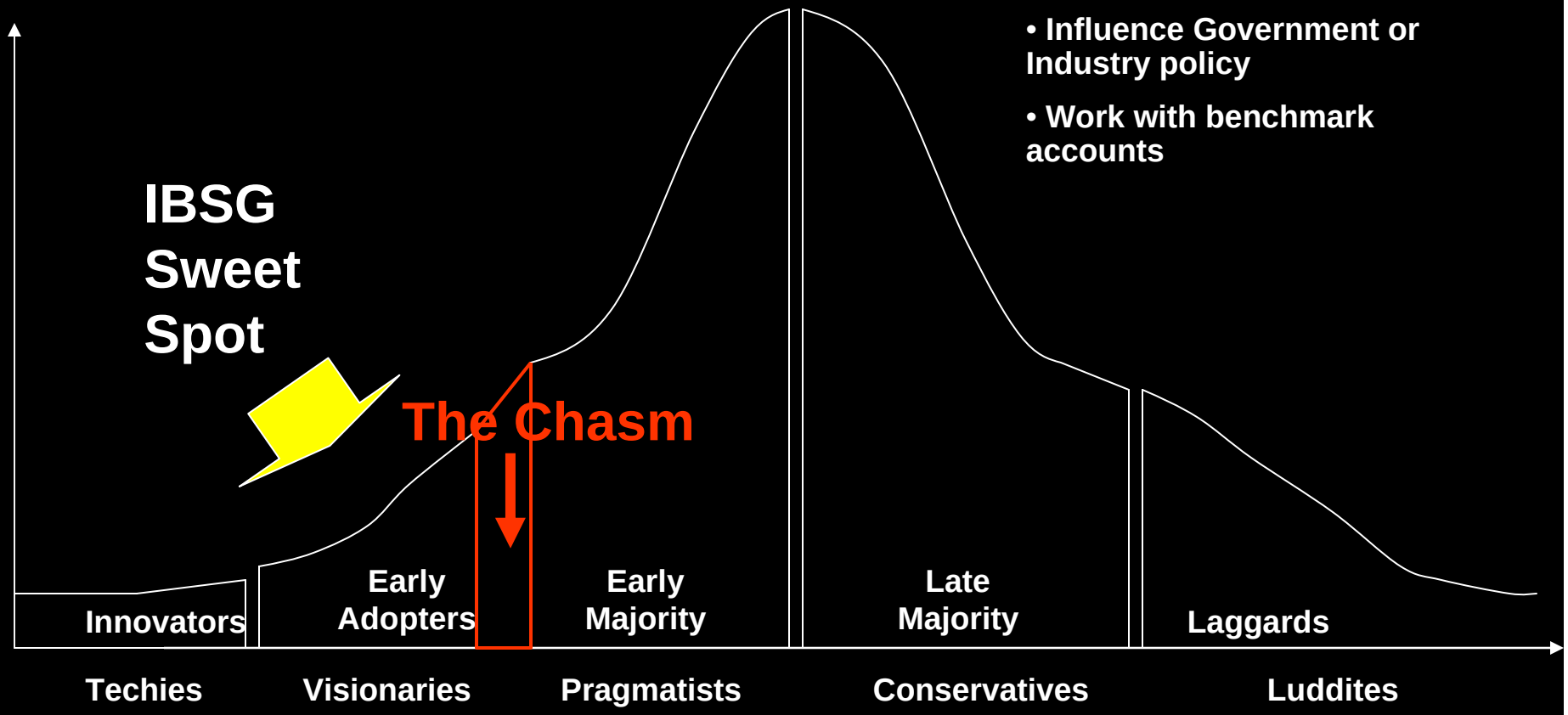
Malaysia, Nov 1 2006

IBSG - Industry Transformation Target Opportunities

Market adoption of Connected Industry solutions

Accelerate Industry Transformation

- **Influence Government or Industry policy**
- **Work with benchmark accounts**



The Last 200 Years: From Telegraph to Genome Mapping

All in less than 0.2 % of human existence!

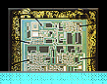
1834: 1st computer (analytical engine)

1906: Invention of the radio

1913:

1958: 1st integrated circuit

1971: 1st microprocessor



1830s:

1878: 1st incandescent light bulb

1940s: 1st general purpose electronic computer

1961: 1st manned space flight

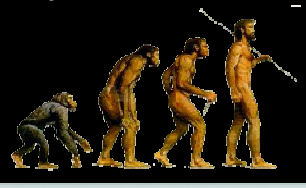
1975: 1st personal computer

2003: Human genome mapping complete

1876: Invention of the telephone

1957: 1st satellite

120,000 years ago: Homo sapiens



6000 BC: Invention of the wheel

1953: Discovery of DNA

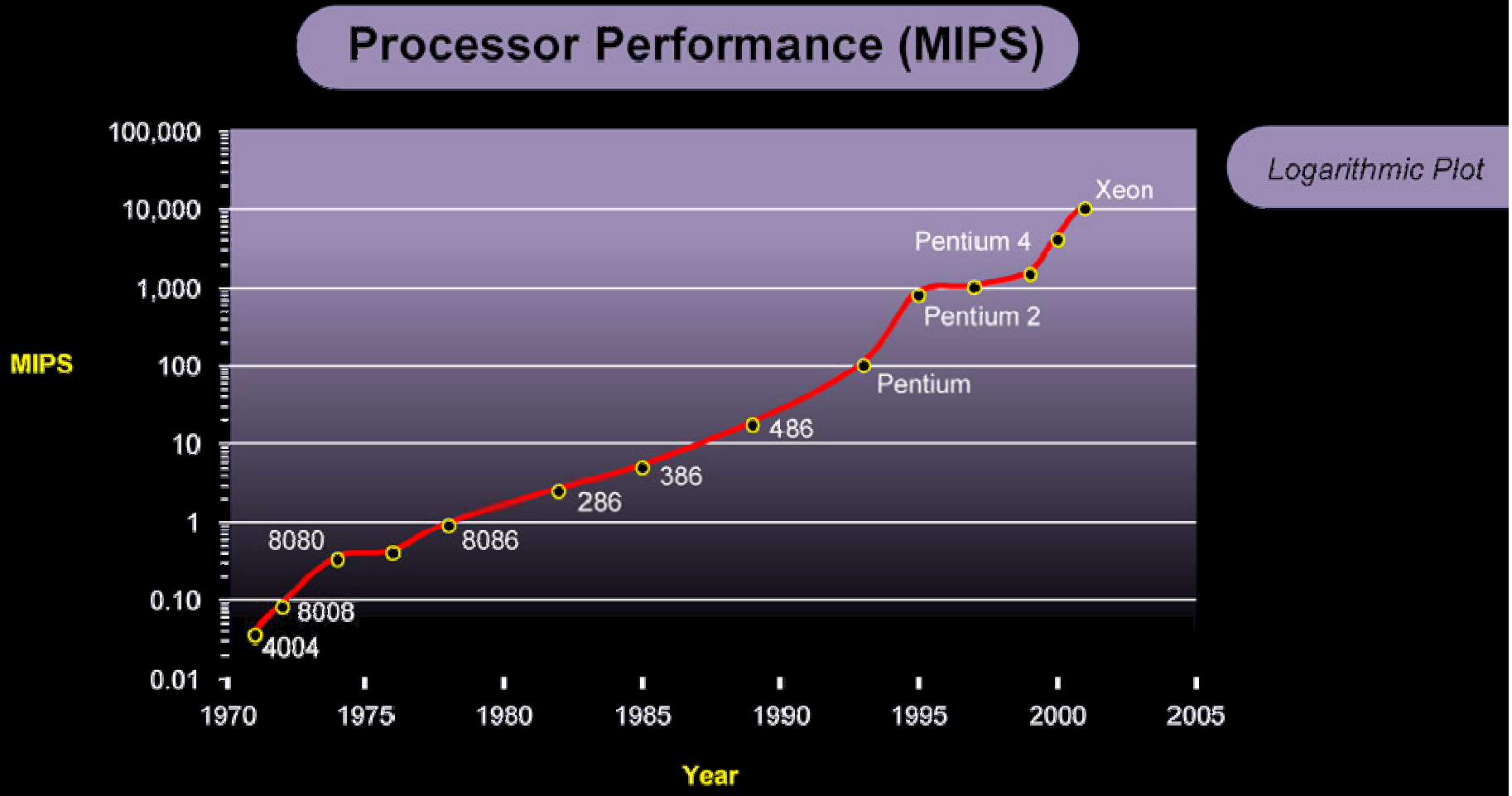
Today

Human History

"Information Technologies (of all kinds) **double their power** (price performance, capacity, bandwidth) **every year**"

Ray Kurzweil, KurzweilAI.net

Processor Performance
Doubling every 18 months

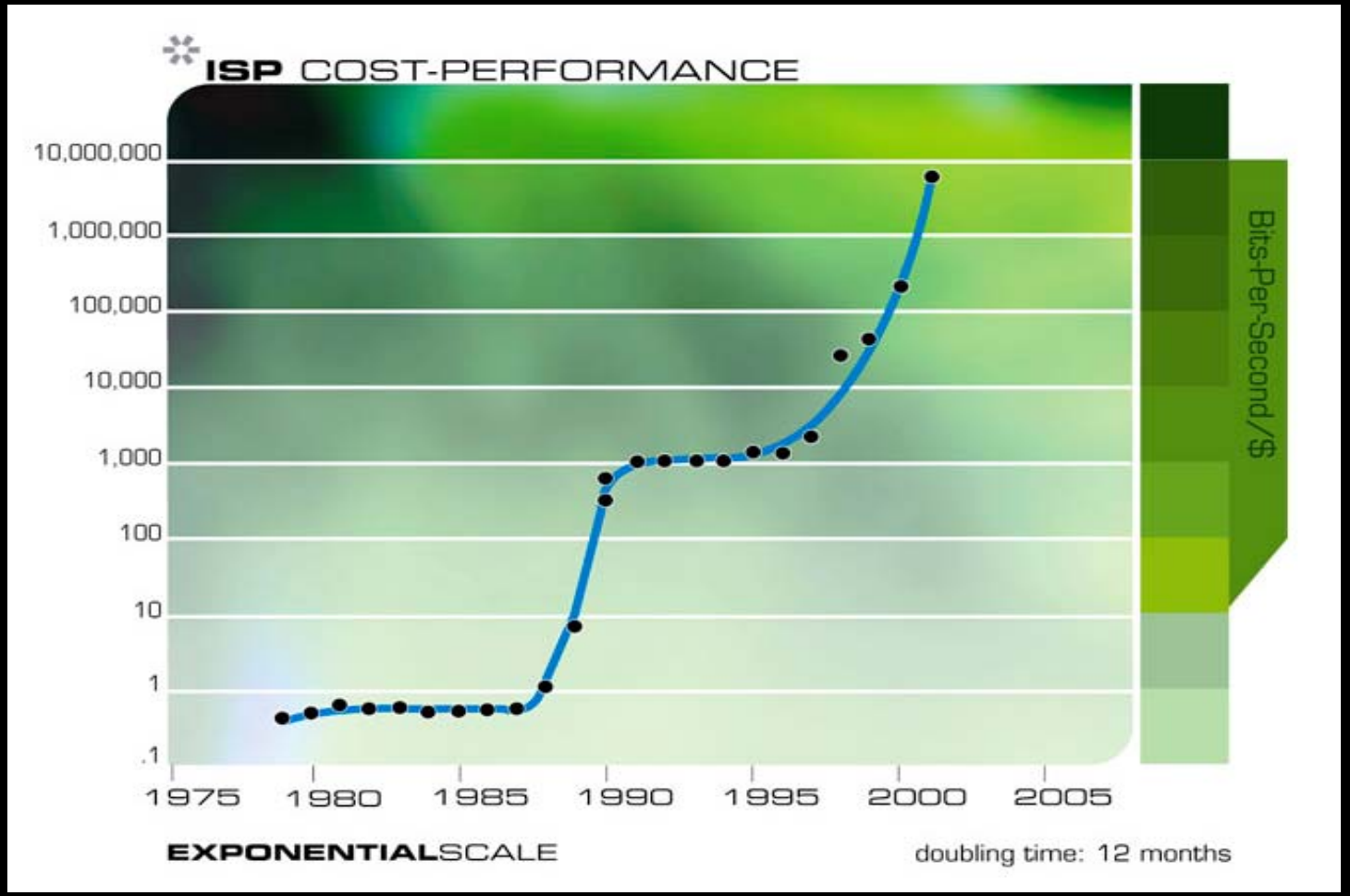


Data from: Intel

Courtesy Ray Kurzweil, KurzweiAI.net

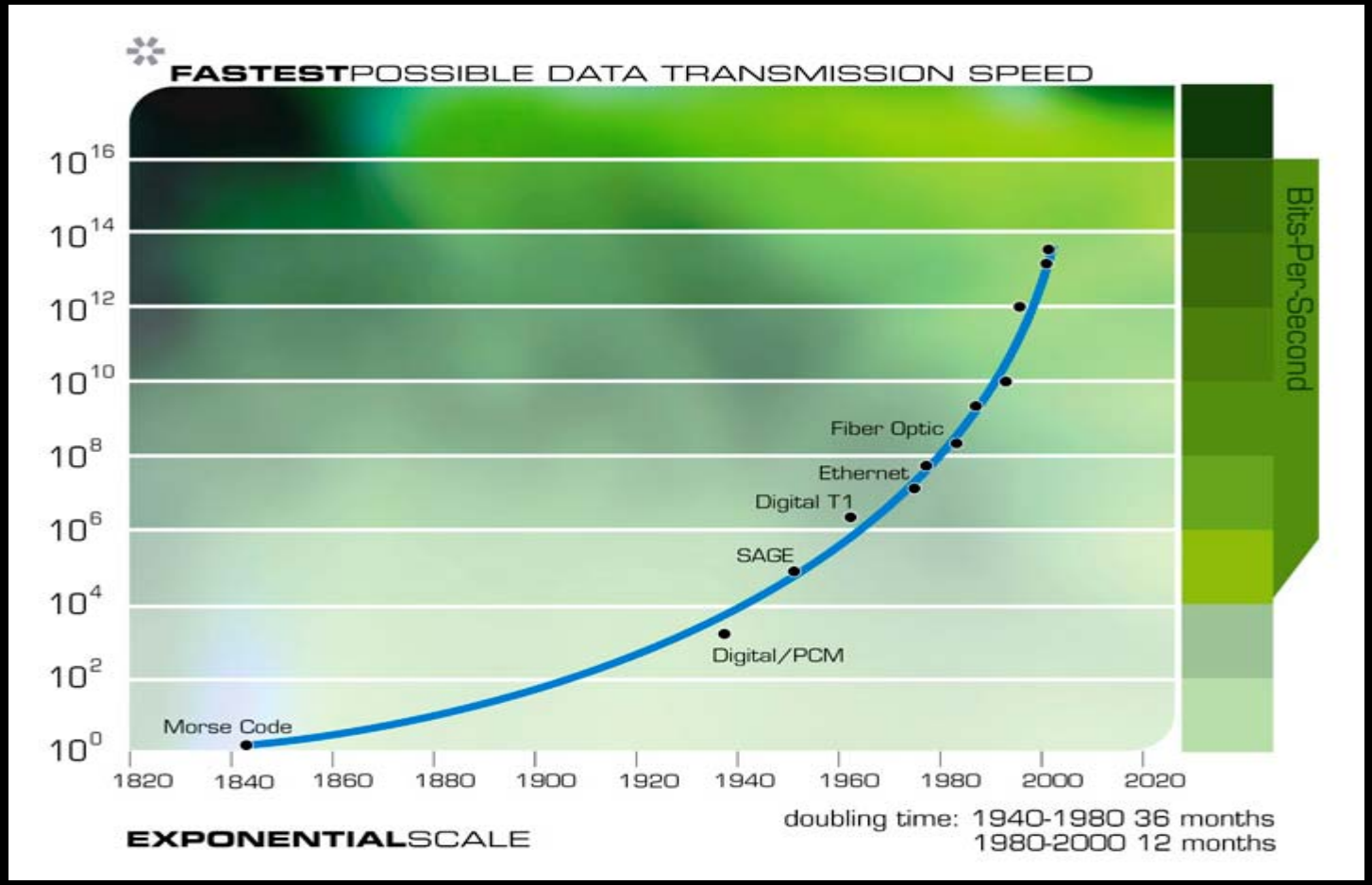
Doubling time: 1.8 years

ISP Cost-Performance
Doubling every 12 months



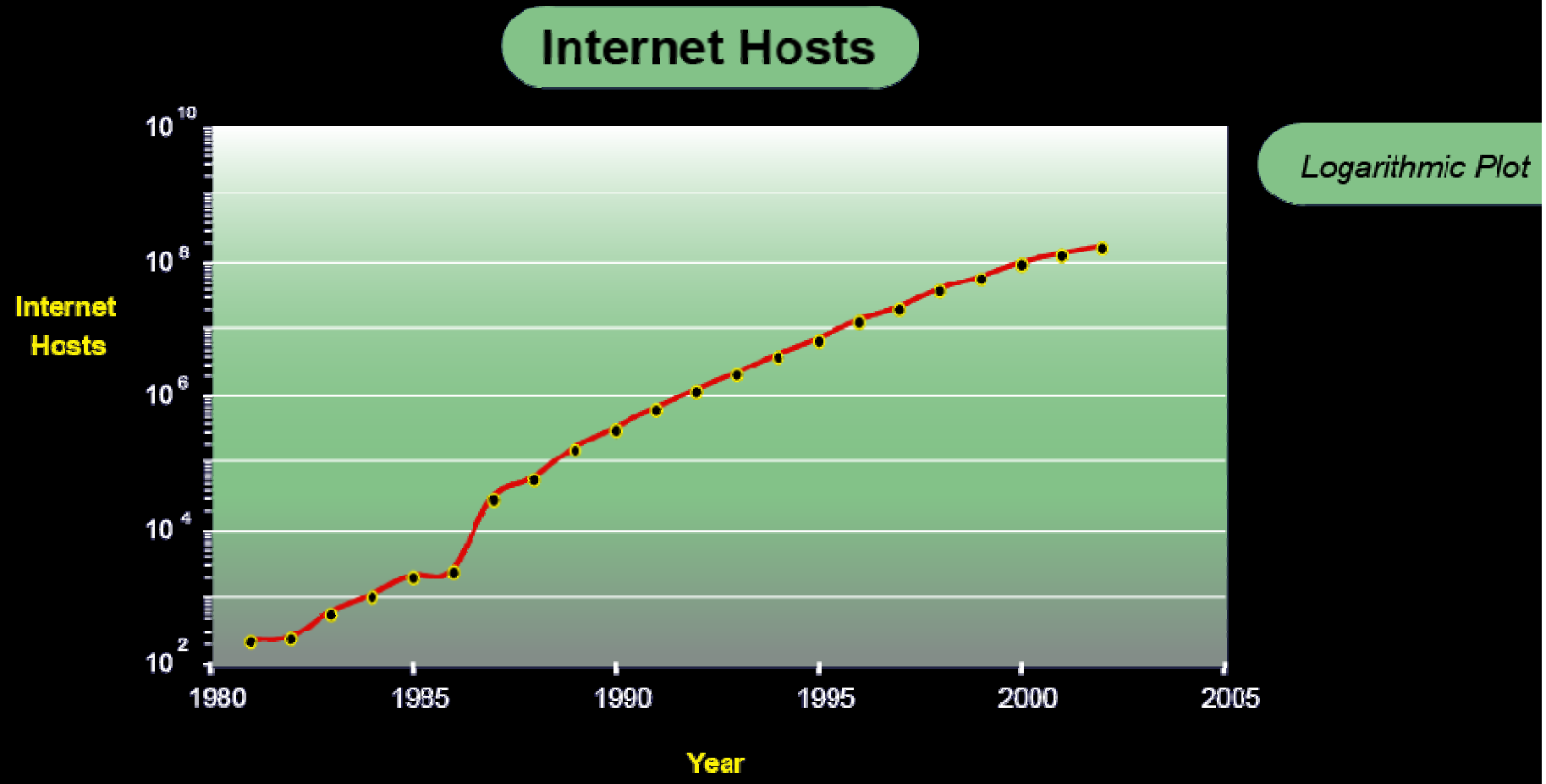
Courtesy Ray Kurzweil, KurzweiAI.net

Transmission Speeds
Doubling every 12 months



Courtesy Ray Kurzweil, KurzweiAI.net

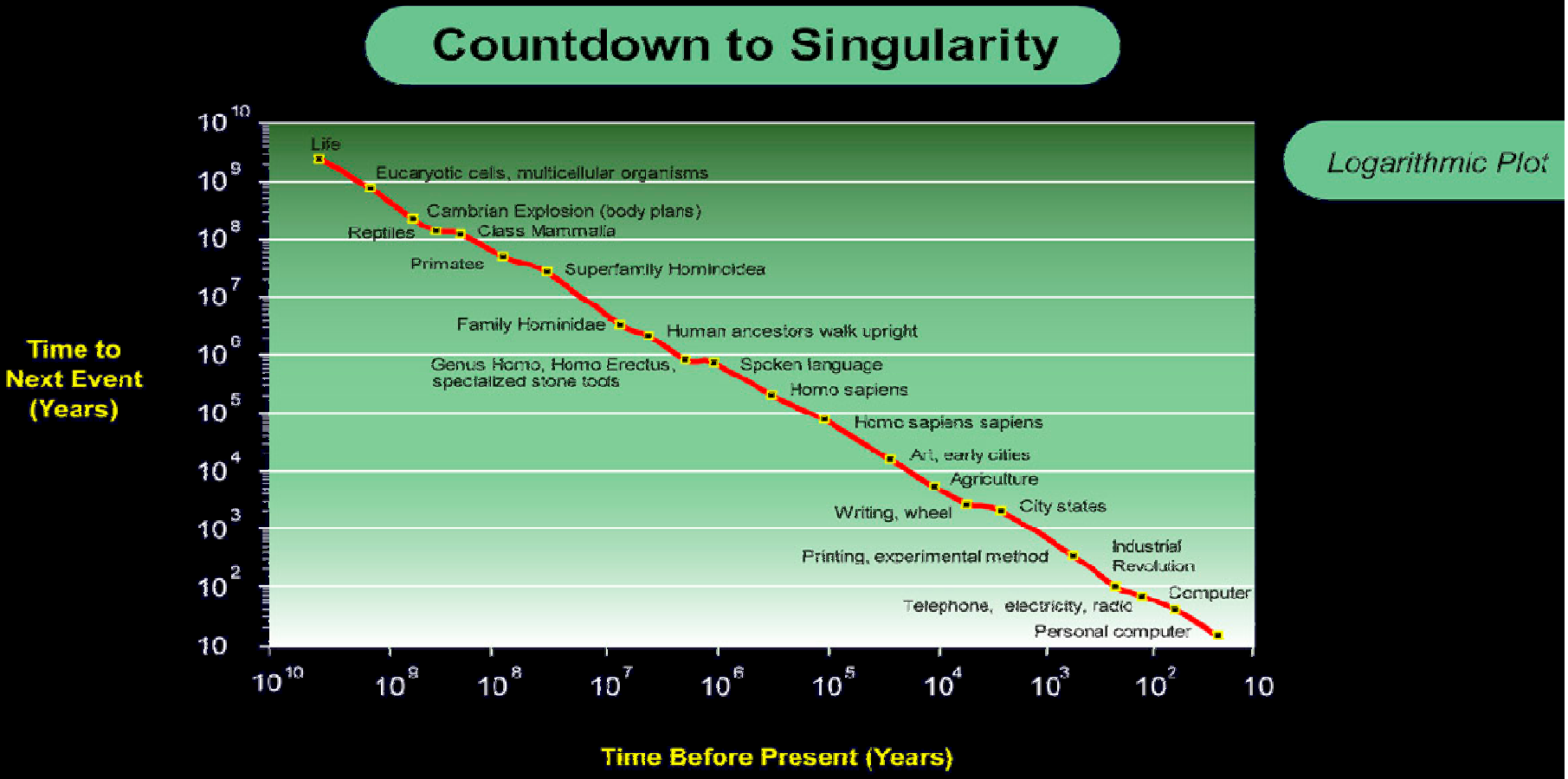
Internet Hosts
Doubling every 12 months



Data from: Internet Software Consortium

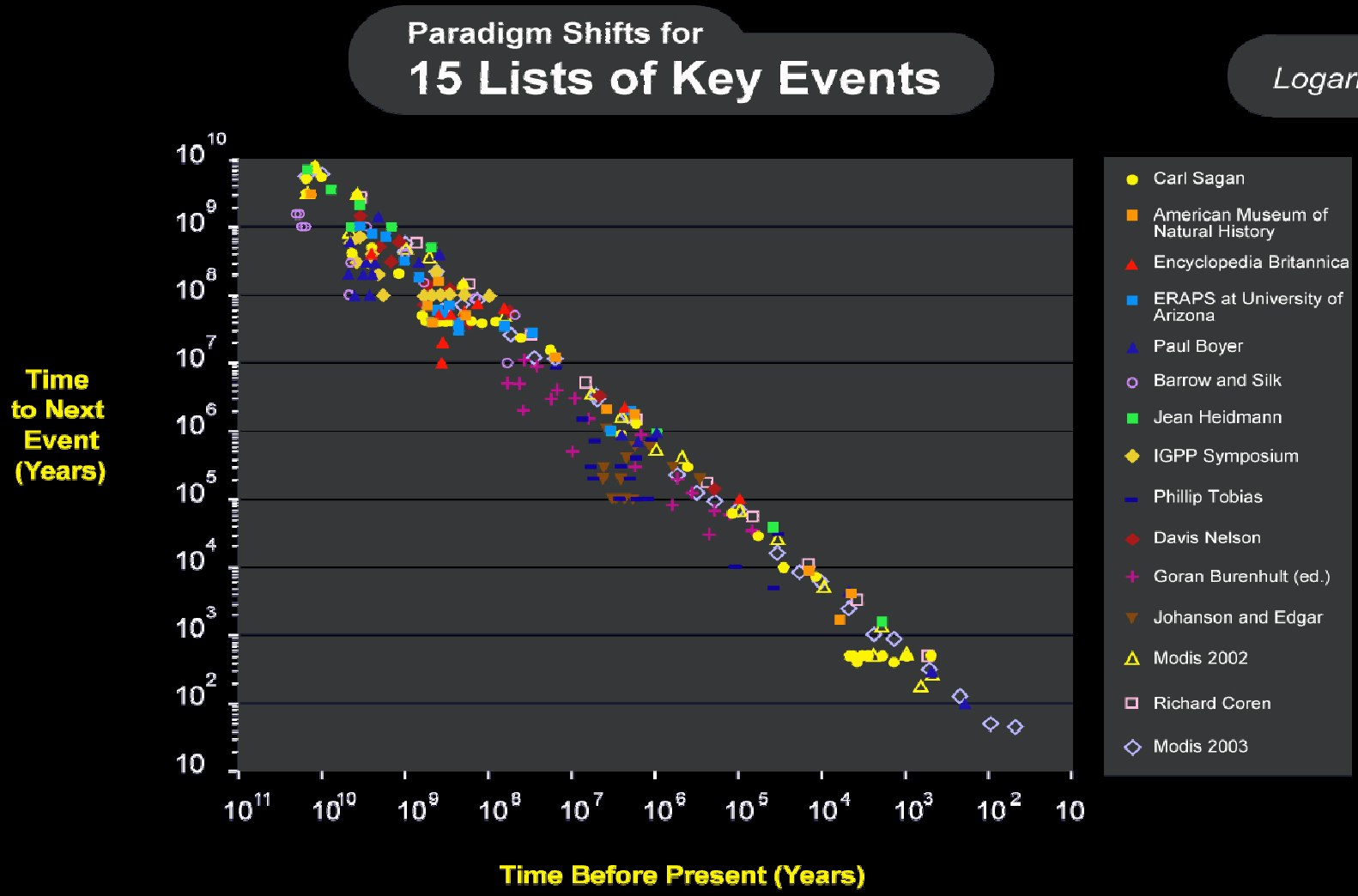
Courtesy Ray Kurzweil, KurzweiAI.net

Every Major Life Event
Exponential Growth



Source: Ray Kurzweil, KurzweilAI.net

Every Major Life Event
Exponential Growth



Source: T. Modis

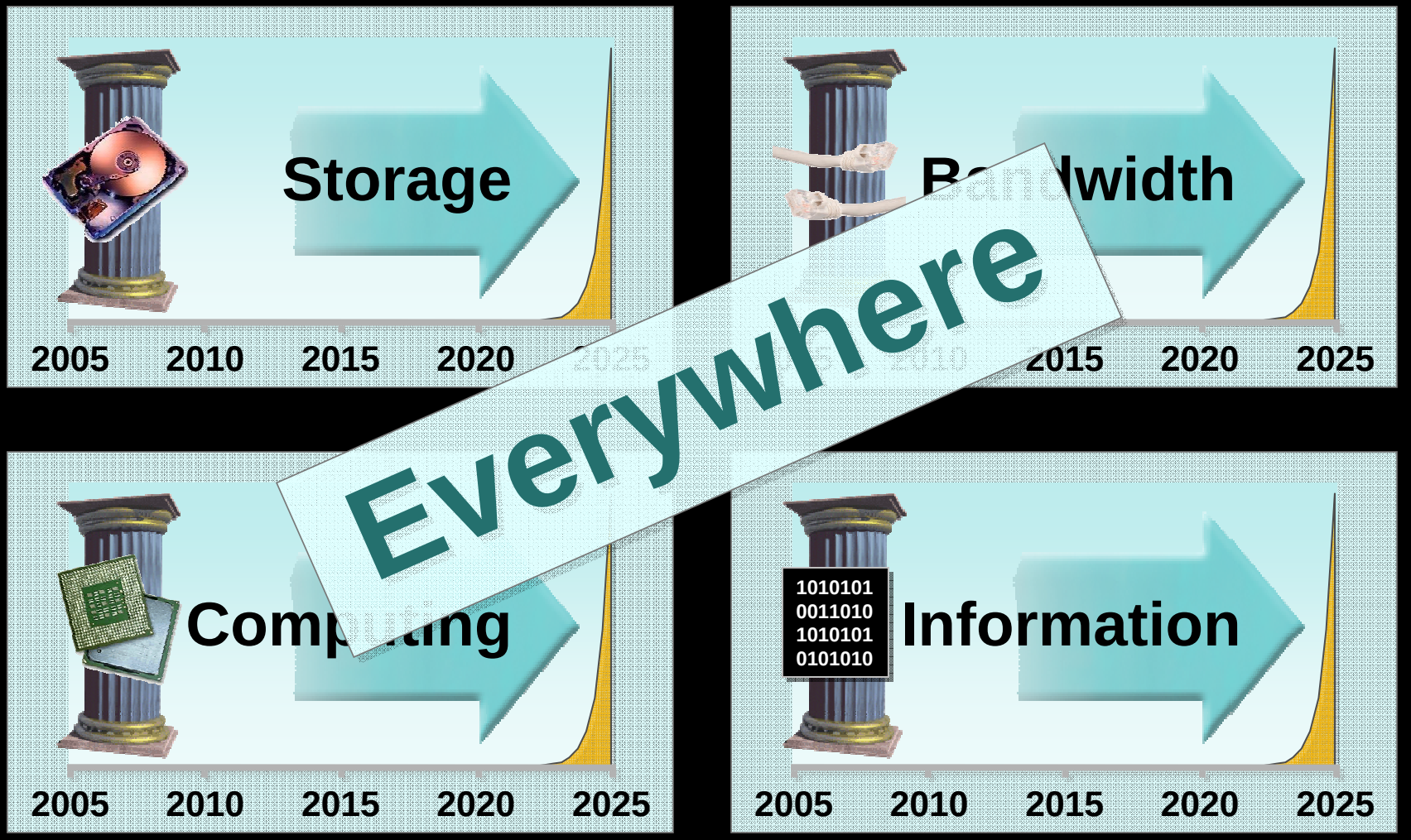
Today's discussion topics

- Pillars of technology change
- The Future of the Internet
- The changing dynamics of the business on the web
- The role of the CIO and what it means to you

Pillars of Technology Change

The Laws of Abundance : Exponential Growth of Technology

Explosive Growth Is Occurring in the Four Pillars of Technology



Storage

More Storage for Less

1956:

1 Megabyte = $65,000*

IBM RAMAC

2005:

700 Megabytes = $0.01*

25 pack = $20

630,000 times increase in storage at 6,500,000% decrease in cost

2025:

630 Gigabytes = $0.01*

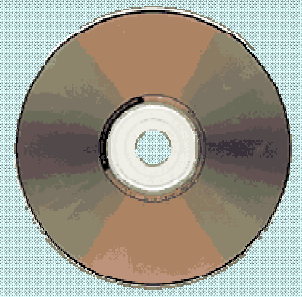
20,800 CDs

21,000,000% decrease in cost

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

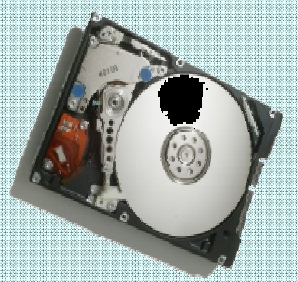
Storage

Timeframe: 1-5 years



Pioneer 500GB DVDs

- Ultraviolet lasers (20x storage of Blue-ray)
- 1 terabyte DVDs under development
- Timeline 1-2 years



Perpendicular recording

- 230 gigabytes per square inch (1 TB PC drives)
- Timeline: 1-2 years

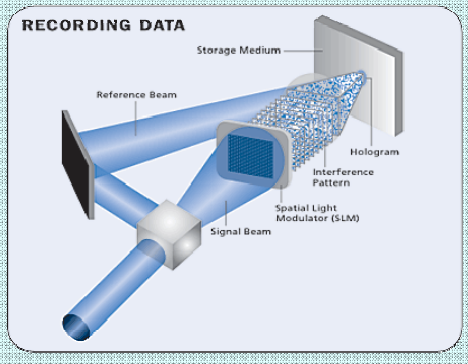
NanoMechanical Memory

- 100 gigabytes per square inch
- Timeline: 2-5 years

InPhase 1.6TB drive

Holographic (3D) storage

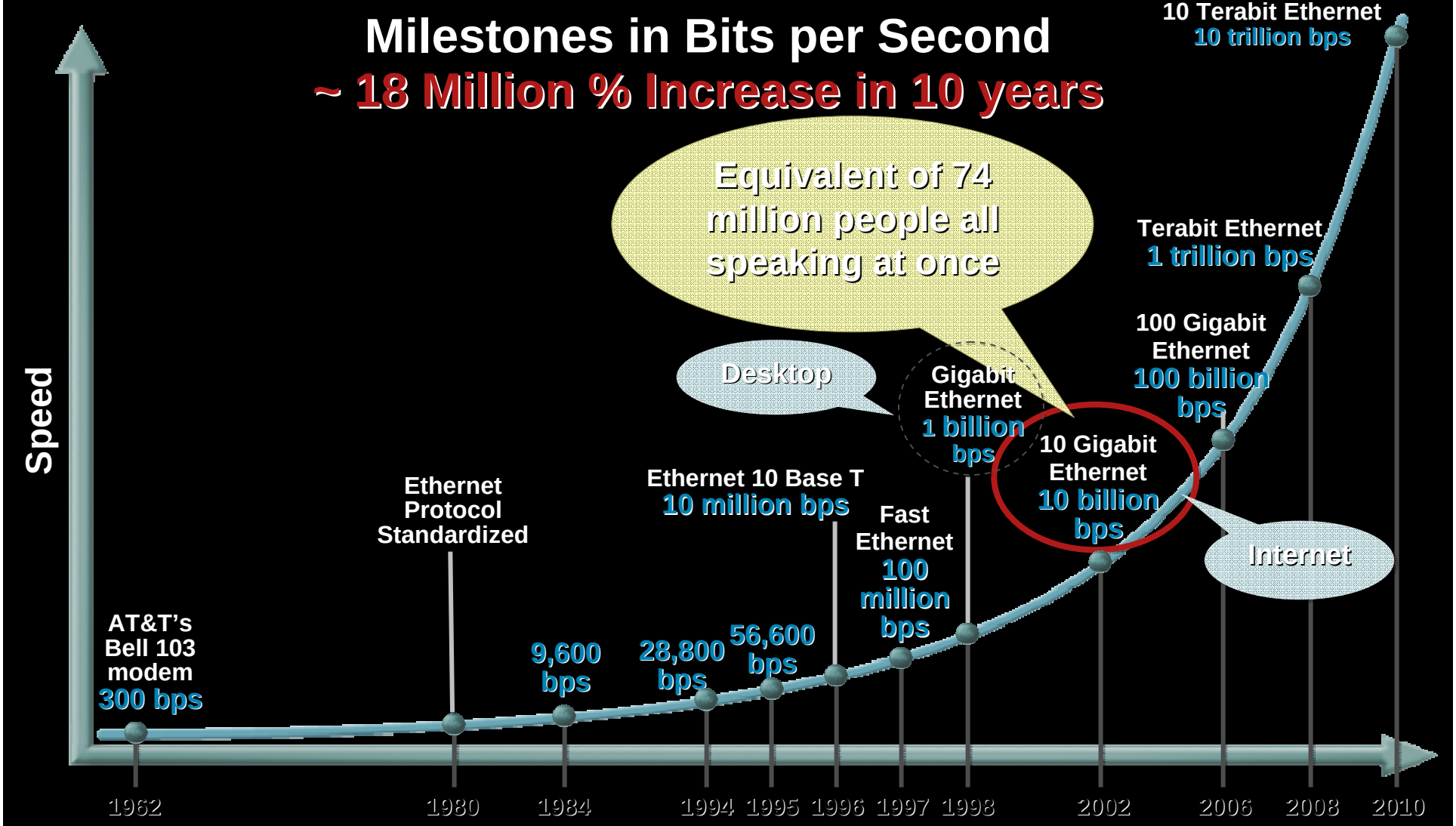
- 1 terabyte in a 1cm cube
- Timeline: 2- 5 years



Network Speed

Milestones in Bits per Second

~ 18 Million % Increase in 10 years



Timeframe: Now

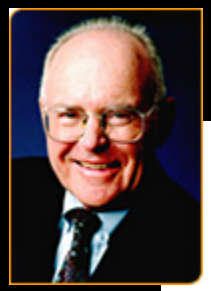
The Cisco Carrier Routing System (CRS-1)*

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**

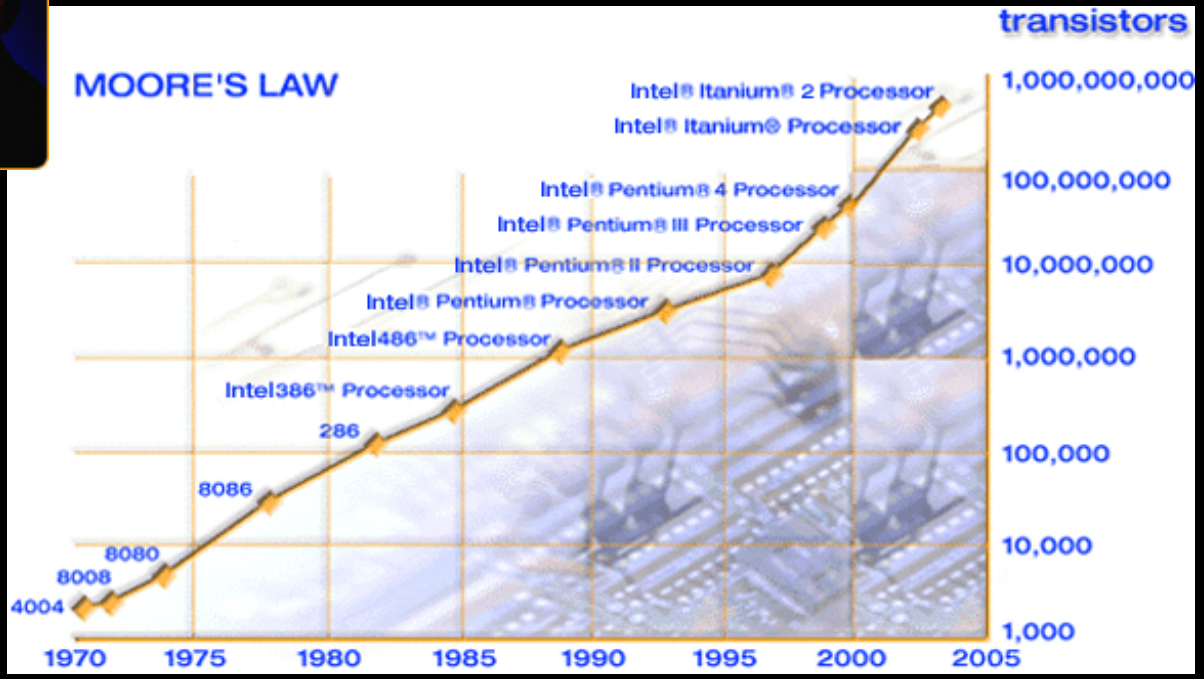
*** Certified by Guinness Book of World Records as the world's highest capacity Internet router.**

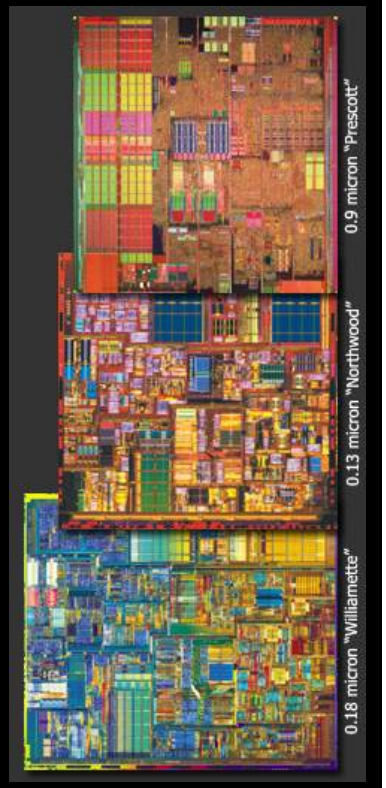
Moore's Law



The number of transistors per square inch on an integrated circuit doubles every 18 months

Gordon Moore, 1965





In 1954, the average price of a transistor was $5.52.
In 2004, the average cost was 191 billionths of a dollar.

Source (graph**): Intel Corporation**

Timeframe: 1 year

- "Cell" chip has been in joint development by Sony, Toshiba and IBM since 2001
  - Prototype introduced in February 2005
- Multi-core, multi-threaded gaming engine has nine cores 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
- 2% of the raw computing power of the human brain for about $200

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: PCWorld, February 2005

Information Explosion: Consider…

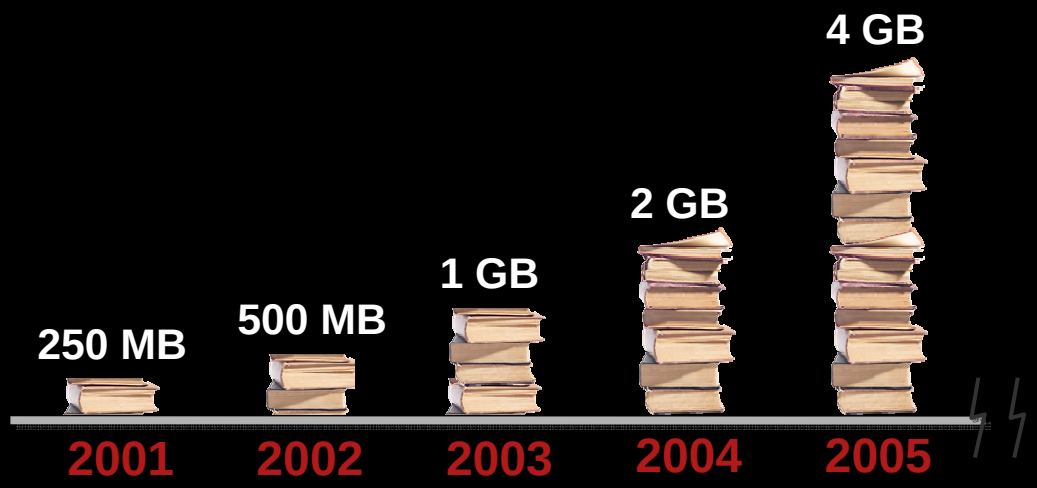
- It took two centuries to fill the U.S. Library of Congress with more than:
  - 29 million books and periodicals
  - 2.7 million recordings
  - 12 million photographs
  - 4.8 million maps, and
  - 57 million manuscripts.
- Today it takes about 15 minutes for the world to churn the equivalent amount of new digital information.
- We do so 100 times every day, for a grand total of five exabytes annually.
  - That's an amount equal to all the words ever spoken by humans.
- In 2003 alone, we generated enough data to fill a half-million Libraries of Congress .

And the pace is accelerating.

Information Explosion: Stored Data Doubles Each Year

Information Stored Per Person Worldwide

It would take 75 feet of books to store the equivalent of 2 GB of data on paper.

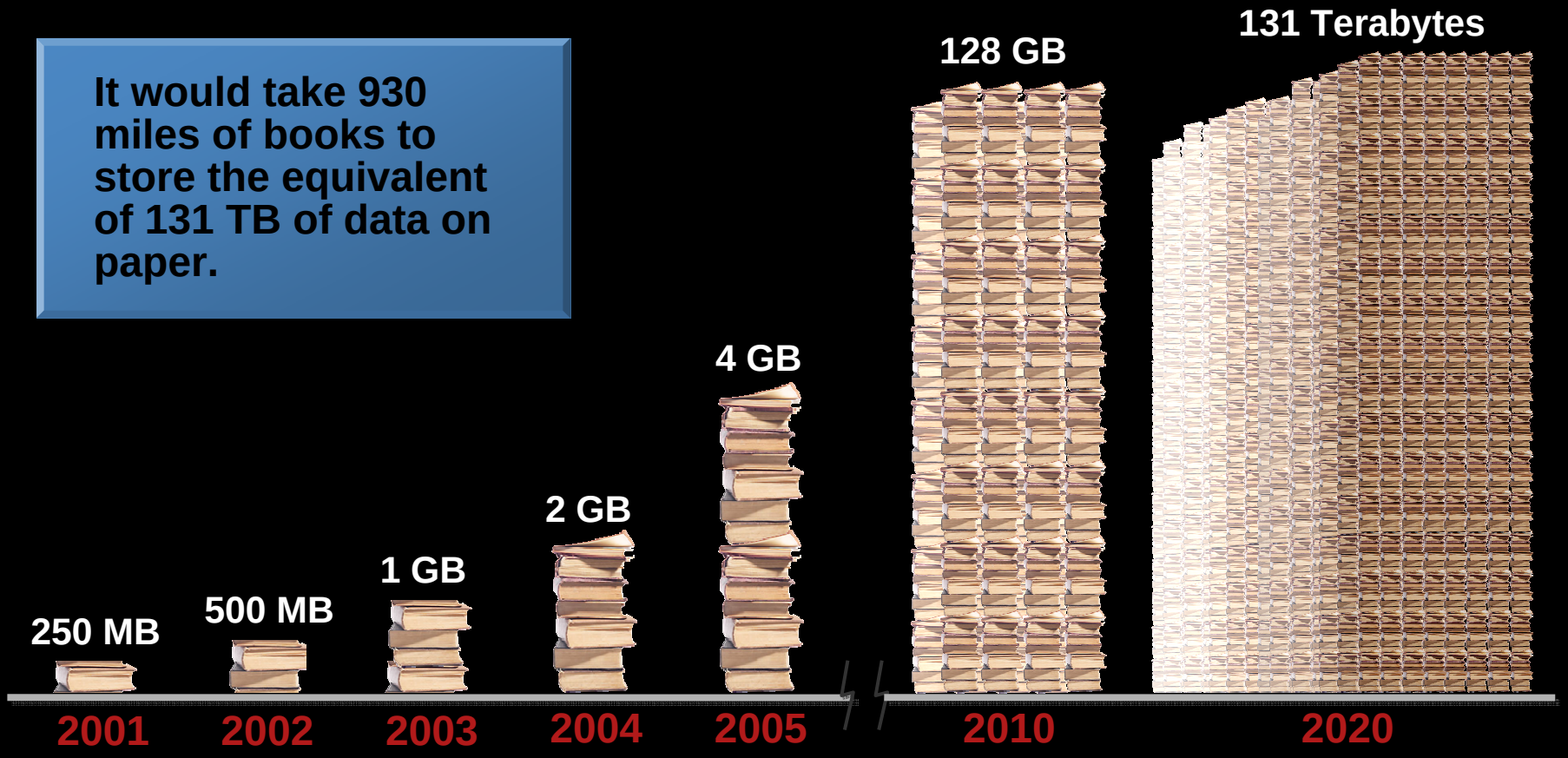


Sources: ExtremeTech, July 2003, University of California at Berkeley, 2003

Information Explosion: Stored Data Doubles Each Year

Information Stored Per Person Worldwide

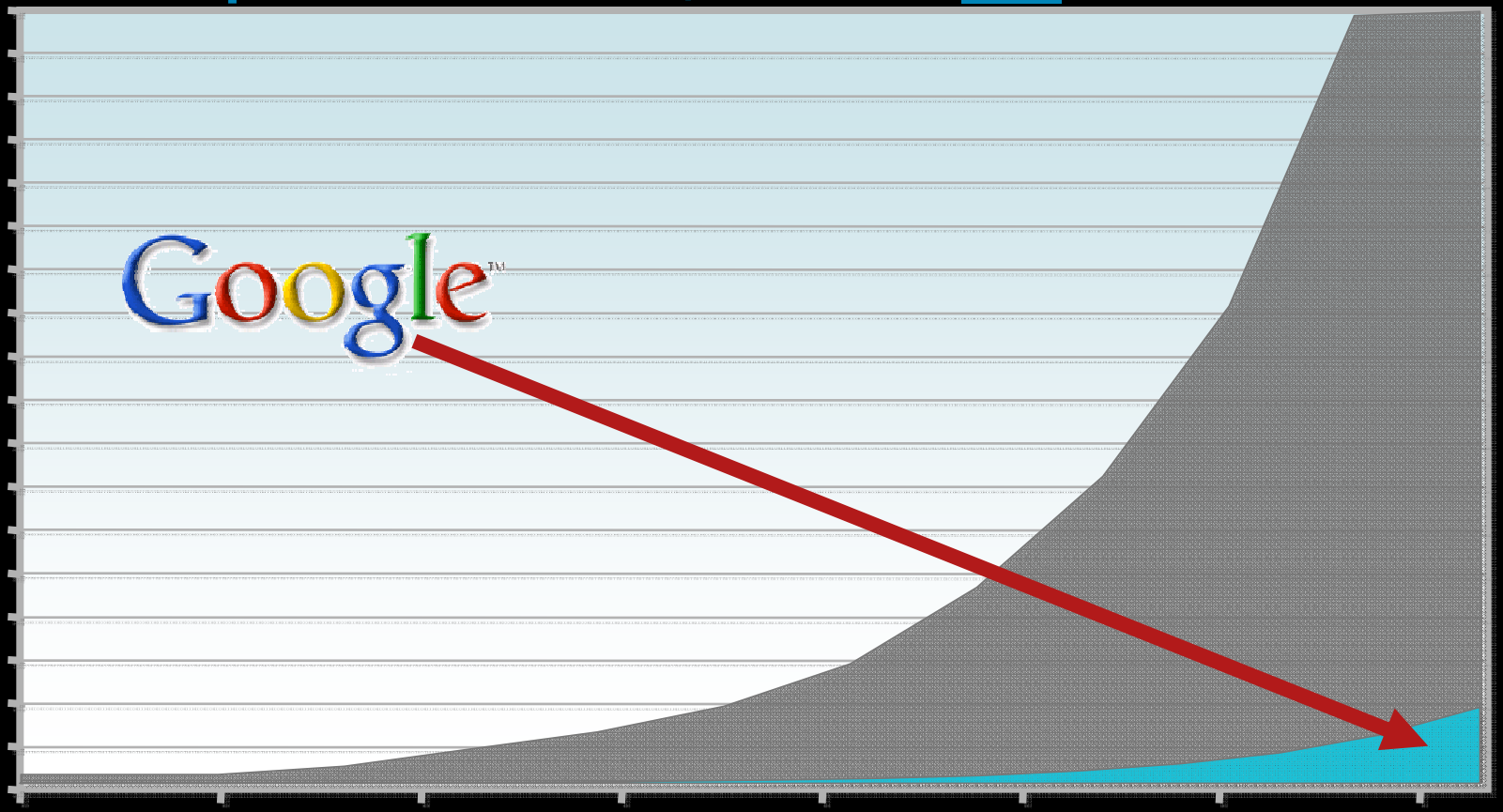
It would take 930 miles of books to store the equivalent of 131 TB of data on paper.



Sources: ExtremeTech, July 2003, University of California at Berkeley, 2003

Information Explosion
The "Dark Web"

Behind Corporate Firewalls, There's 500 Times More Data*



*This graph only shows a 100 times comparison.
(It's actually 5 times greater than this graph shows!)

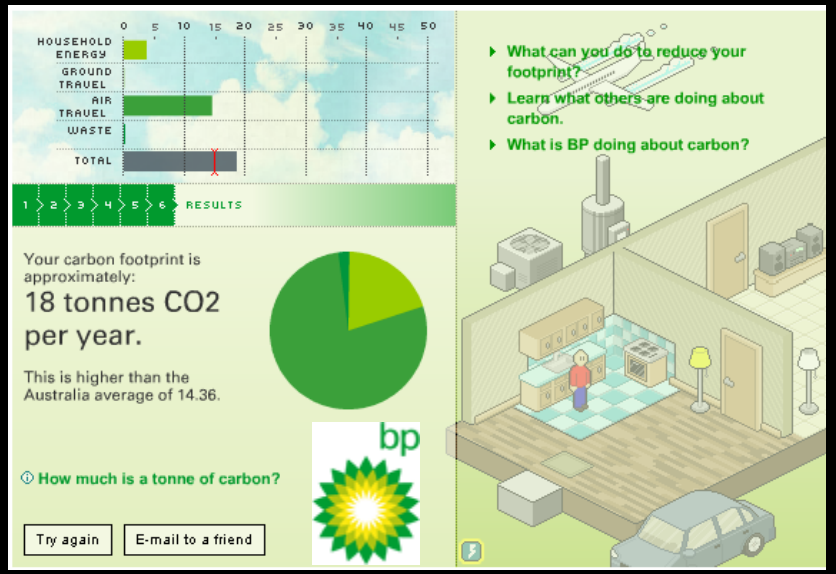
The Abundance of information

Organization	Description
myspace.com a place for friends	67 million members; fastest growing site in the United States
flickr	2.5 million registered users have uploaded over 100 million images
YouTube	Users sharing 20,000 new videos, watching 10 million each day
Gmail	“Over 2775.261837 megabytes (and counting) of free storage so you'll never need to delete another message”

The 5th Pillar ?

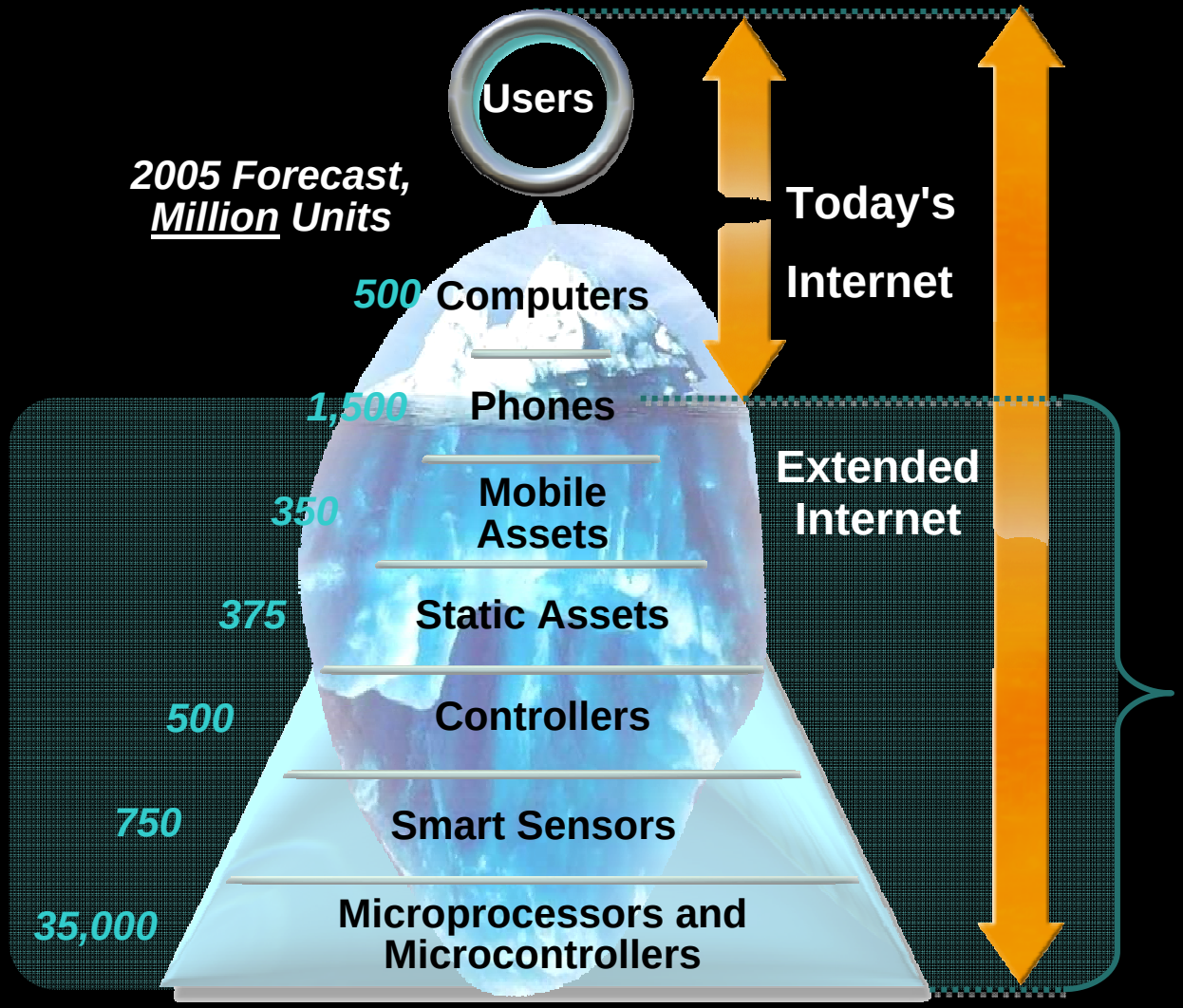
"The issue that should united the west is Energy and it's challenges" …

Thomas Friedman, Oct 28 2006 NY Times



The Future of the Internet

The Internet Will Extend to Billions of New Devices



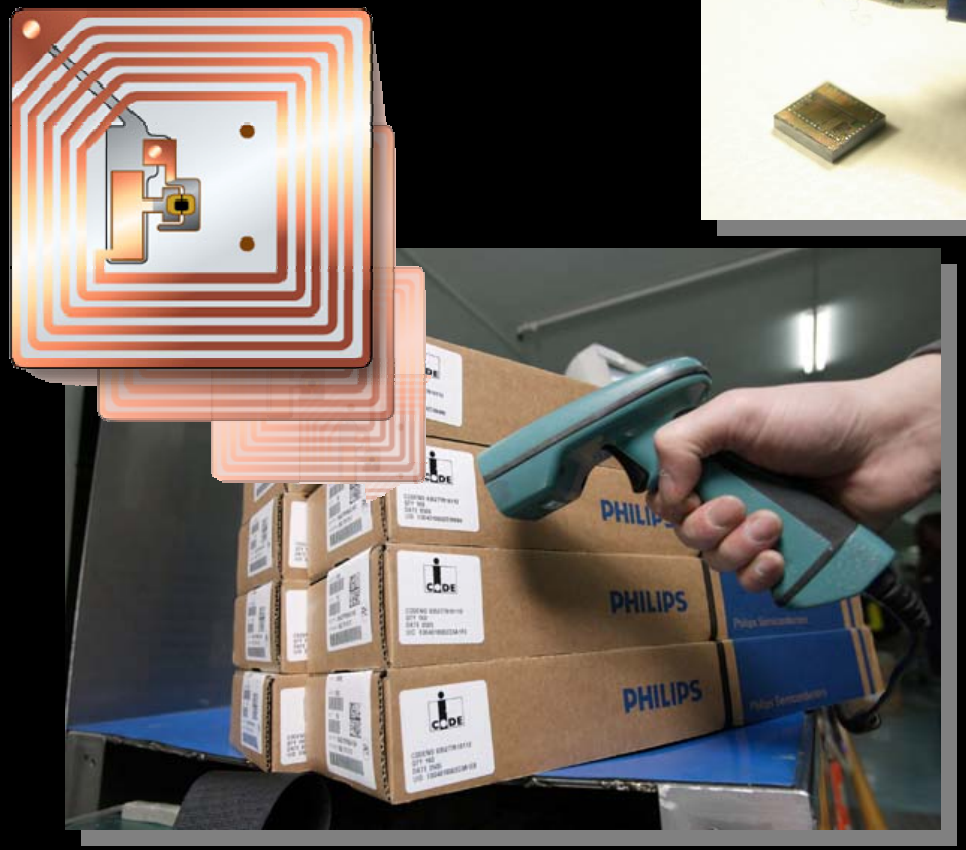
As IP becomes pervasive, devices that do not exist today will be connected to the Internet.

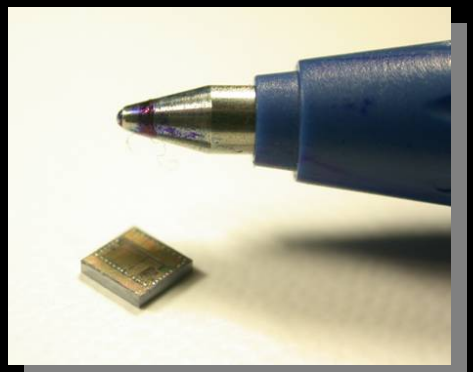
Source: Harbor Research, Inc., Forrester Research, Inc., IBSG

Billions of New Internet Inhabitants

RFID

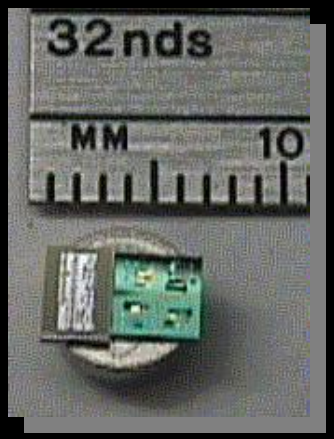
- **An estimated 50 billion tags and 10 billion readers by 2010**





“Smart Dust” Sensor Networks—Everywhere

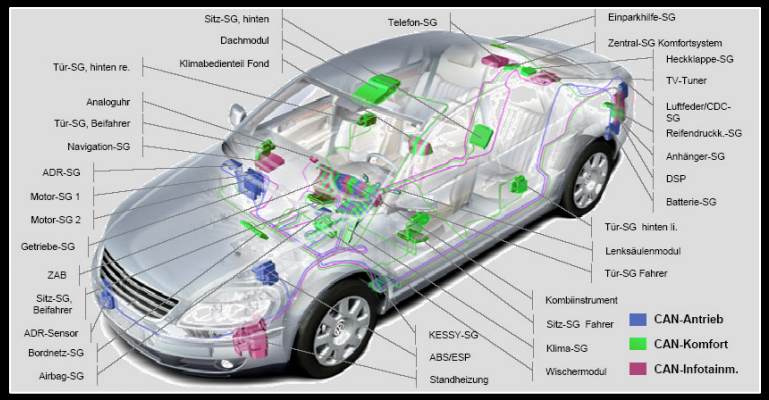
- **“Motes” are linked to sensors which detect temperature, air flow, humidity, etc.**
- **They communicate in an ad-hoc, wireless mesh network.**



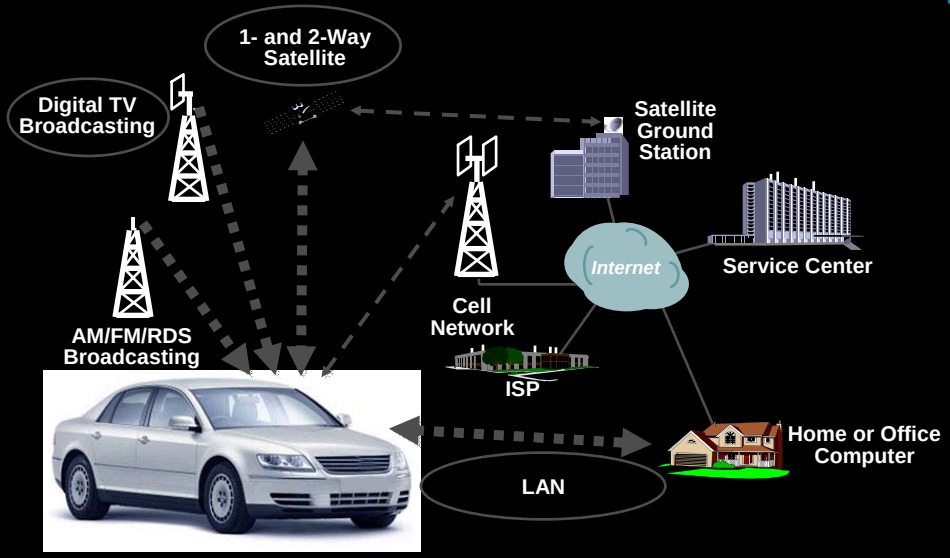
Source: Forrester Research, Inc.

Manufacturing Example : Connected Products: Smart Cars

A car's components are networked



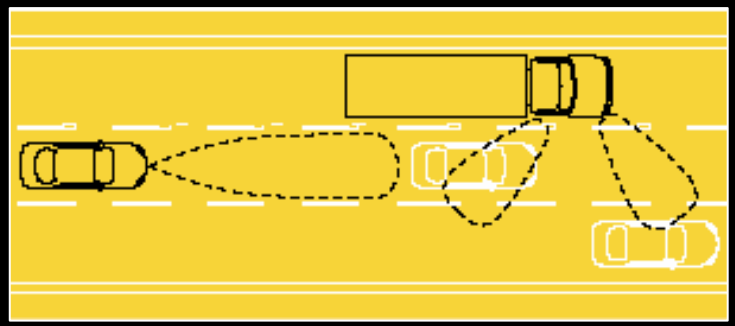
Then connected to external networks



Benefits

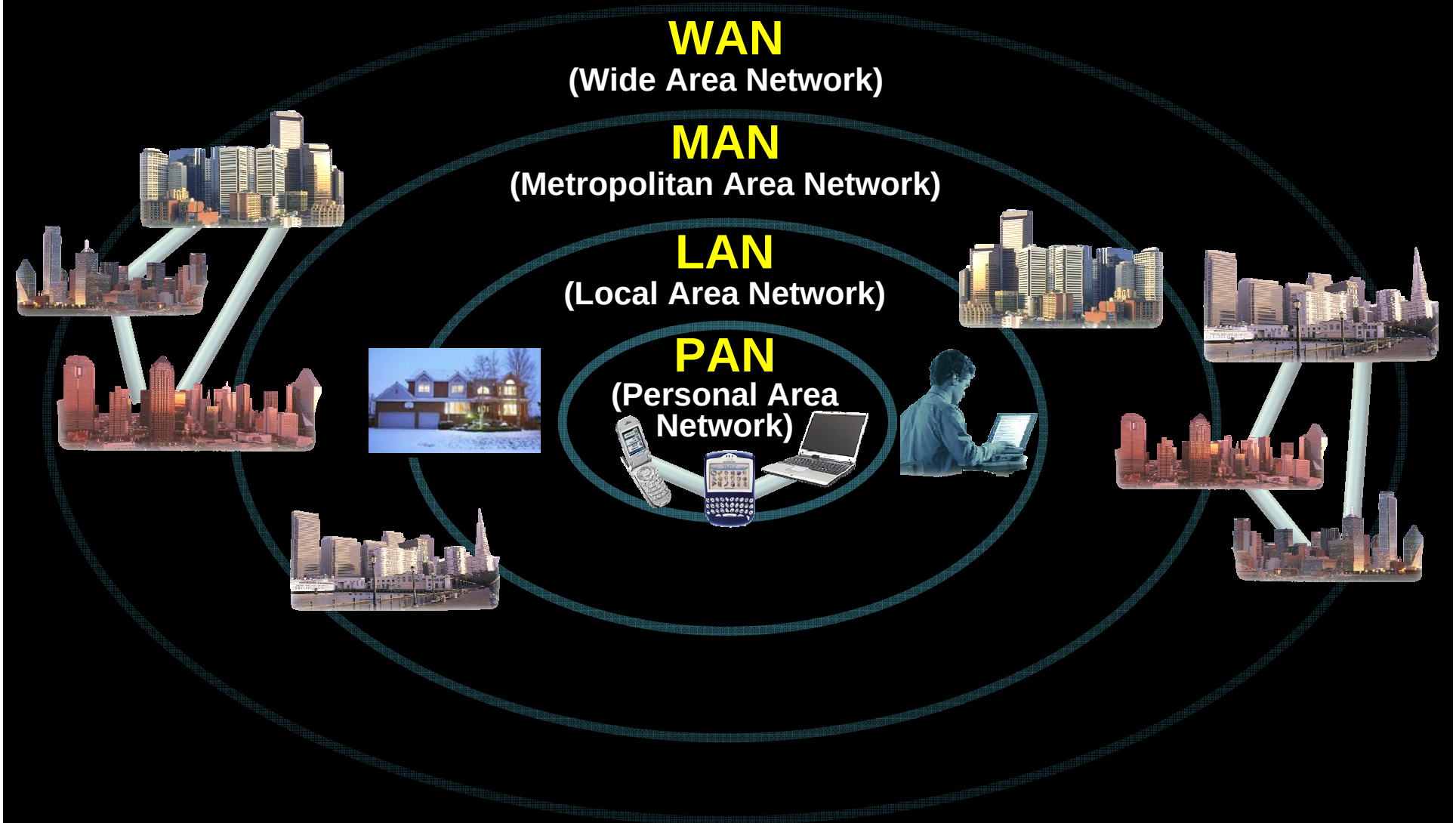
- New services and value opportunities for consumers and OEMs
- New revenue opportunities
- Pricing premiums from product differentiation
- Enhanced brand image
- Decreased cost to service

Sensing provides driver assistance



Peer to peer creates self-organizing mobile systems

Wireless Will Be Everywhere



New Devices:
Your Phone Will Become Your Computer

Only 14% of people in the world are now connected to the Internet … (As low as 8% connect from their homes

Is this how the rest will get online?

Capability

Time

- By 2010, 1.25 billion people will have 3G- and 3.5G-enabled mobile phones
- An NTT DoCoMo 4G phone download a DVD movie in 12 seconds; available in 2010

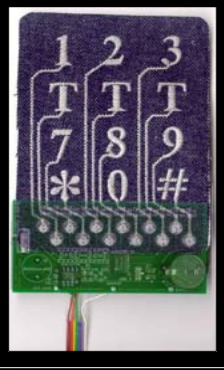
New Capabilities: Universal Translation

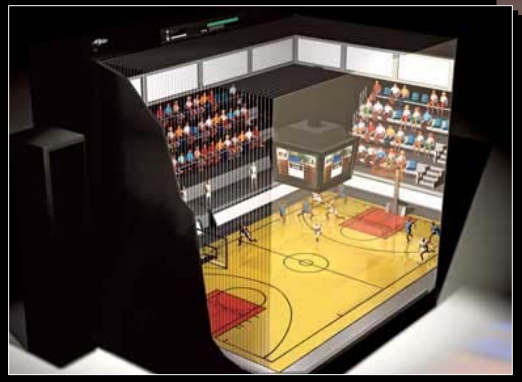
All communication modes are interchangeable. Transmit in one format and “read” in an other.

Any content…any device…any language…any time.

All powered by the network.

New Ways to Interact with Technology: Any Surface Becomes a Display





New Ways to Interact with Technology: Virtual People

- Automatic emotions, gestures and responses
- Speech recognition
- Text to speech
- Knowledge of previous encounters (memory)

"It's my conclusion that it's possible to make a conscious computer with superhuman levels of intelligence before 2020."

Ian Pearson, head of futurology at British Telecommunications

Virtual Reality Examples

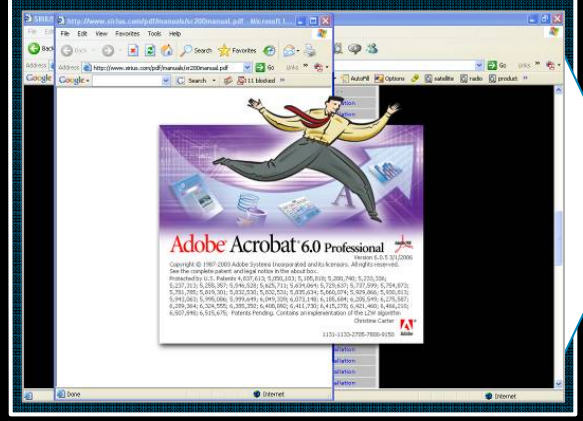
Organization	Description
	Uses online virtual customer account manager to guide users through Web site
	Uses “My Virtual Model” avatars to let customers “try on” clothes, using their exact measurements and body type
	Uses popular avatar personalities in call centers
	Uses popular avatar personalities in call centers

Today:
How does this effect you as a consumer

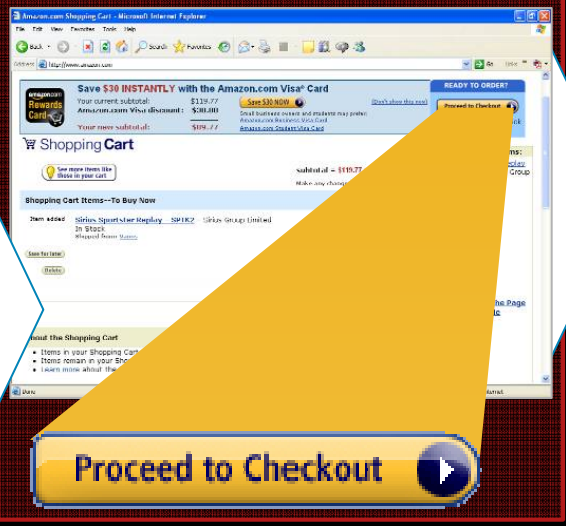
Expanding Influence of the Consumer

- Linear, static transmission of information from enterprise to consumer
- Opportunities for consumer to make use of online information, including commerce
- User-to-user communication, consumer-led content creation, and exchange of information and rich media

Information

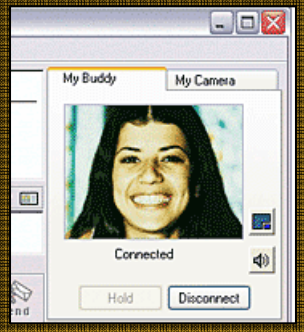


Transactions



User-Driven

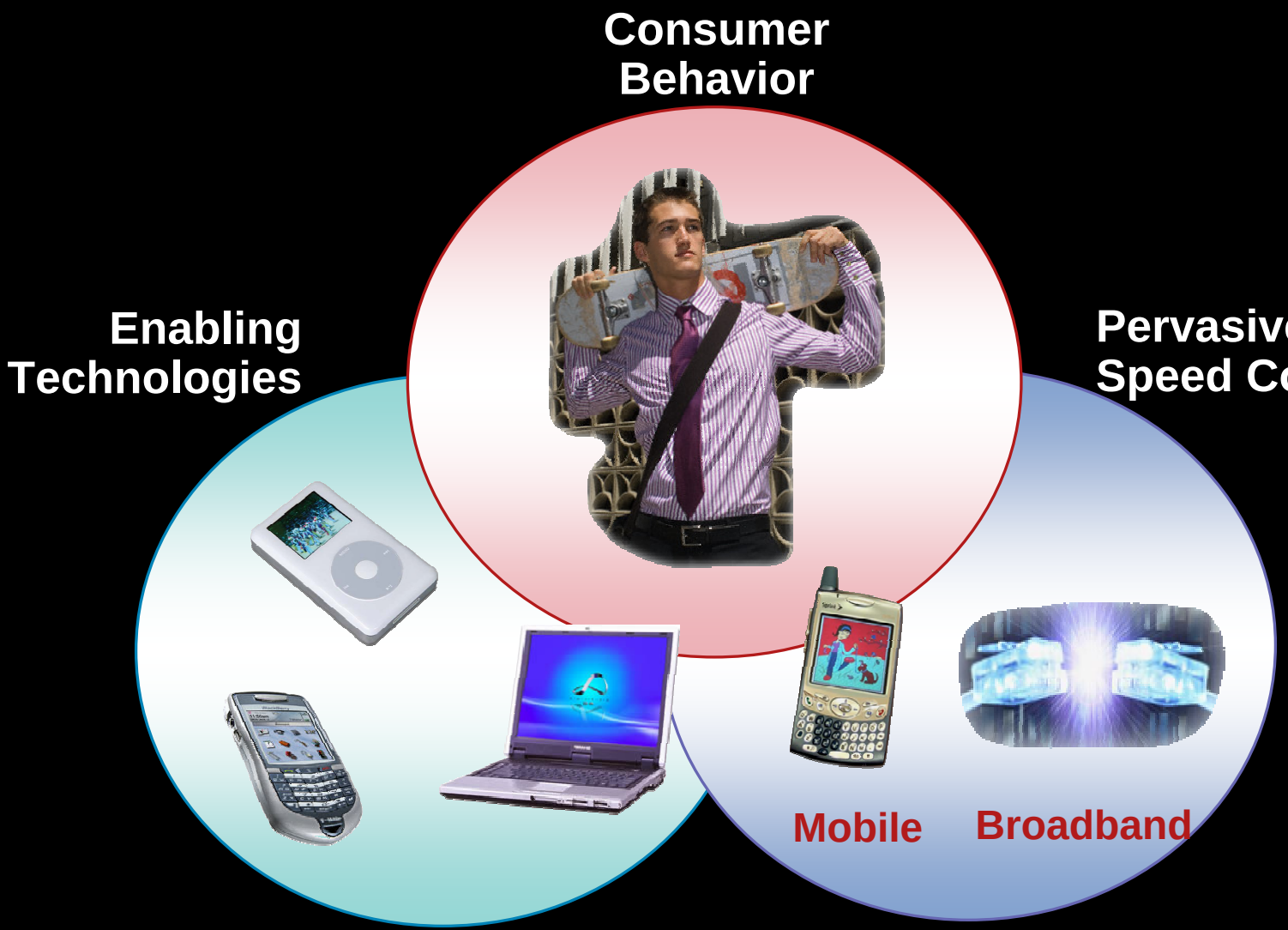
flickr BETA™ LinkedIn® SECOND LIFE myspace.com a place for friends



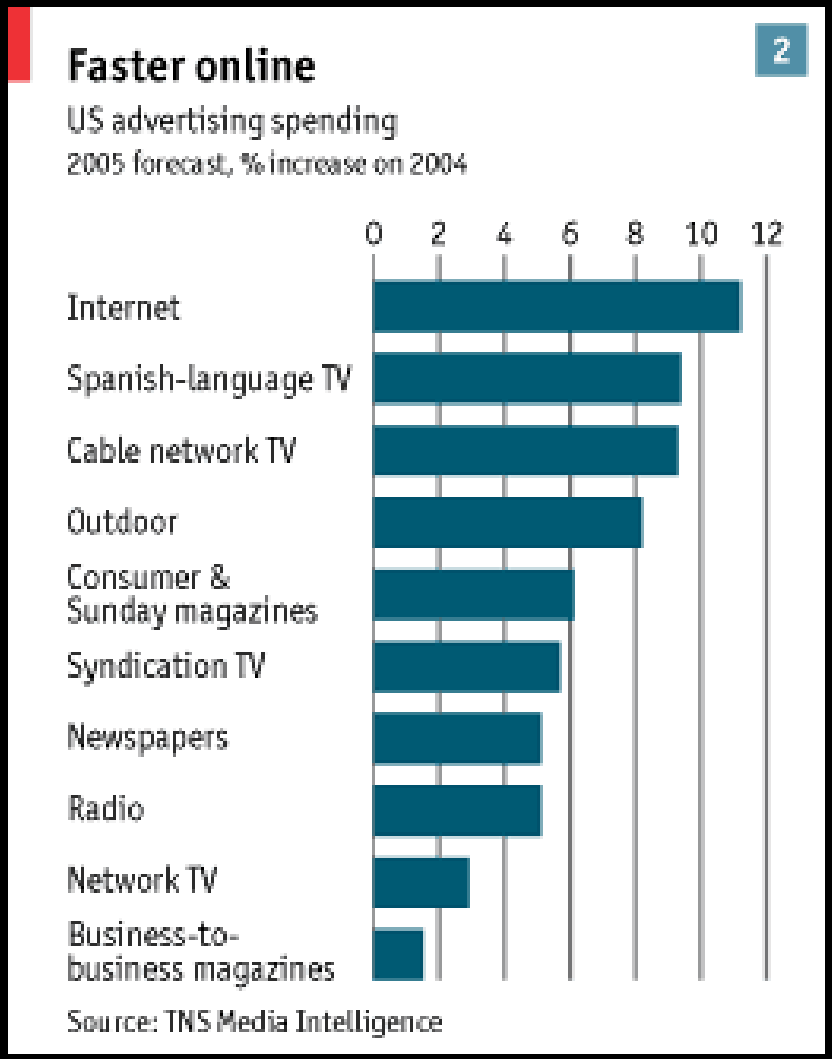
What's Changed?

- Locus of innovation shifting from the enterprise to the consumer
- Customers increasingly conditioned by tools and capabilities of the consumer-to-consumer world
- Unprecedented challenge for enterprises to maintain relevance and add value to consumers
- Peers and strangers can influence customer buying decisions as much or more than the enterprise itself
- New "venues" to engage with potential customers, reducing importance of traditional marketing mechanisms

Drivers of the Next Generation Web



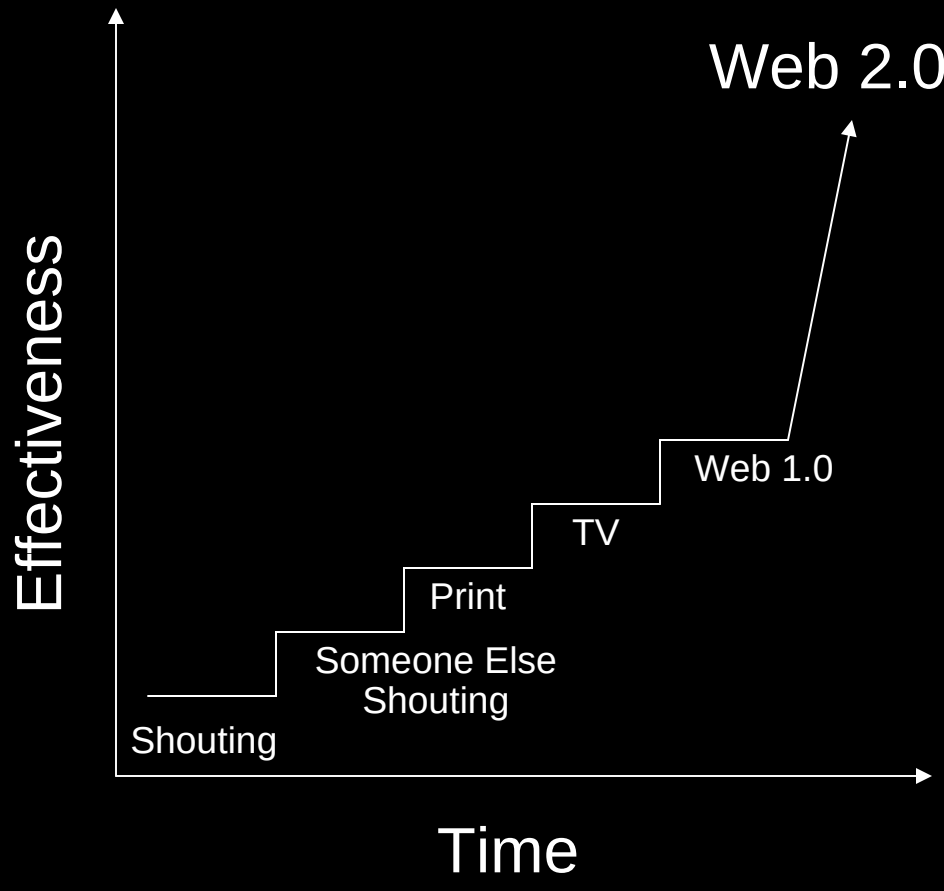
Shift in Spending for global advertisers



- 428 billion in global revenues
- "Heineken quits TV"
- In 1994 Amex spent 85% of advertising revenue in TV, Today it is 35%
- BMW annual increase in online advertising budget is 15%. IBM 11%
- Cost of a 30sec slot at SuperBowl is $2.4m
- TV has just switched : Most content is now subscription based rather than advertising paid for.

Move from CPM to pay-per-click to CPA (Cost per action)

Web 2.0 allows targeted messaging and reduces advertiser waste



- New marketing mantra of engagement : Courtesan, Court Jester, Courtier
- Involvement in online communities, blogs, wiki's, social networking sites. Employment of *lurkers*
- Engagement of consumer in the innovation process

The advertising revolution, driven by changes in consumer behavior and consumer power

- People trust "People like me".
- Engagement – take a stand. Campaignforrealbeauty.com
- Perpetual Beta – do it now, test, fail, learn, adapt, repeat
- All advertising will be digital to an audience of 1

It’s not just the advertising industry going through massive change bought on by new technologies and the next generation web

- Where is my next growth revenue stream coming from?

- Globalisation of key processes
- Connected products

- Expanding Reach
- Reducing errors and Integration of value chain

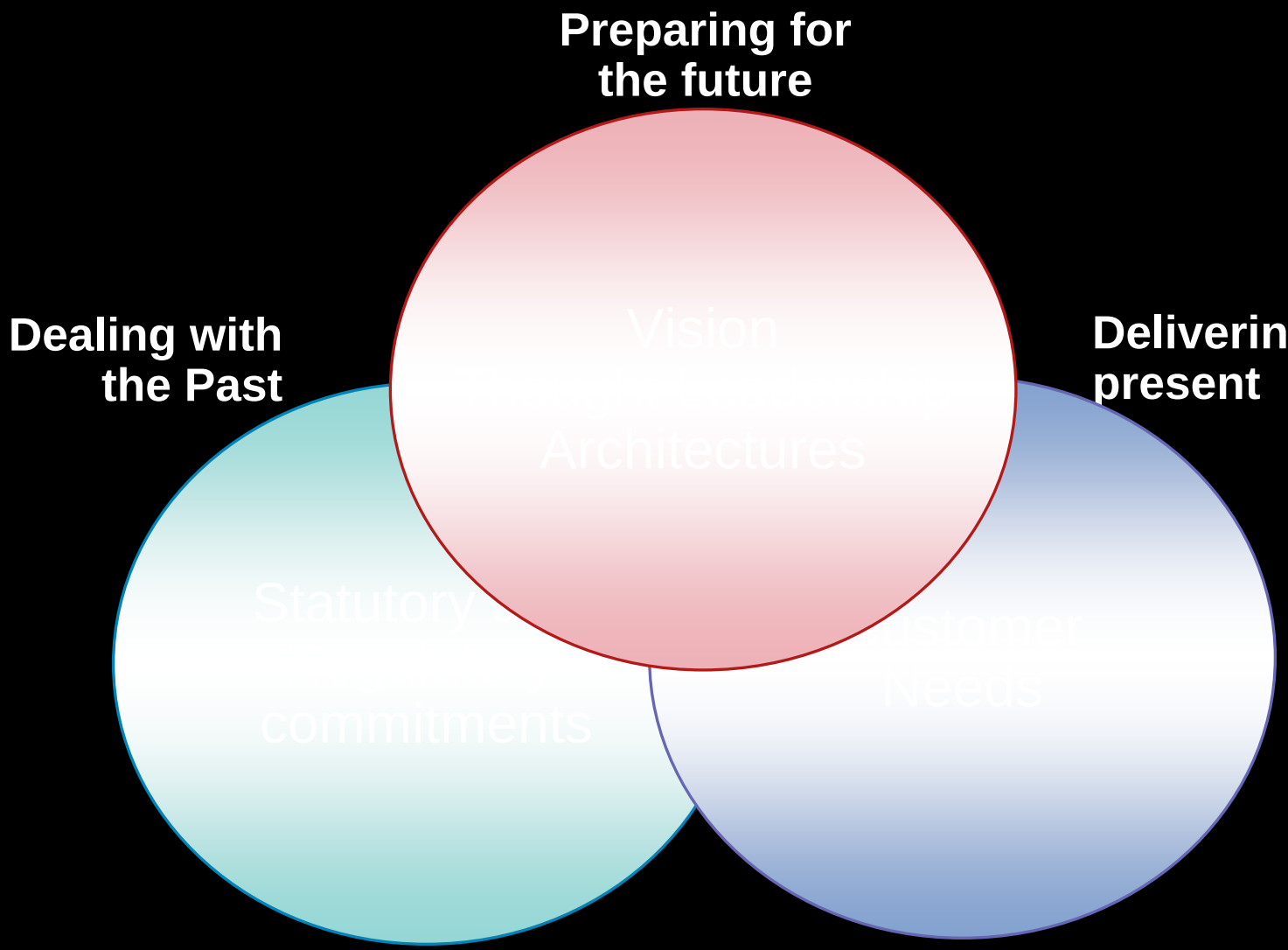
- How do I improve customer experience
- Real Time supply chain

- Continuity and security

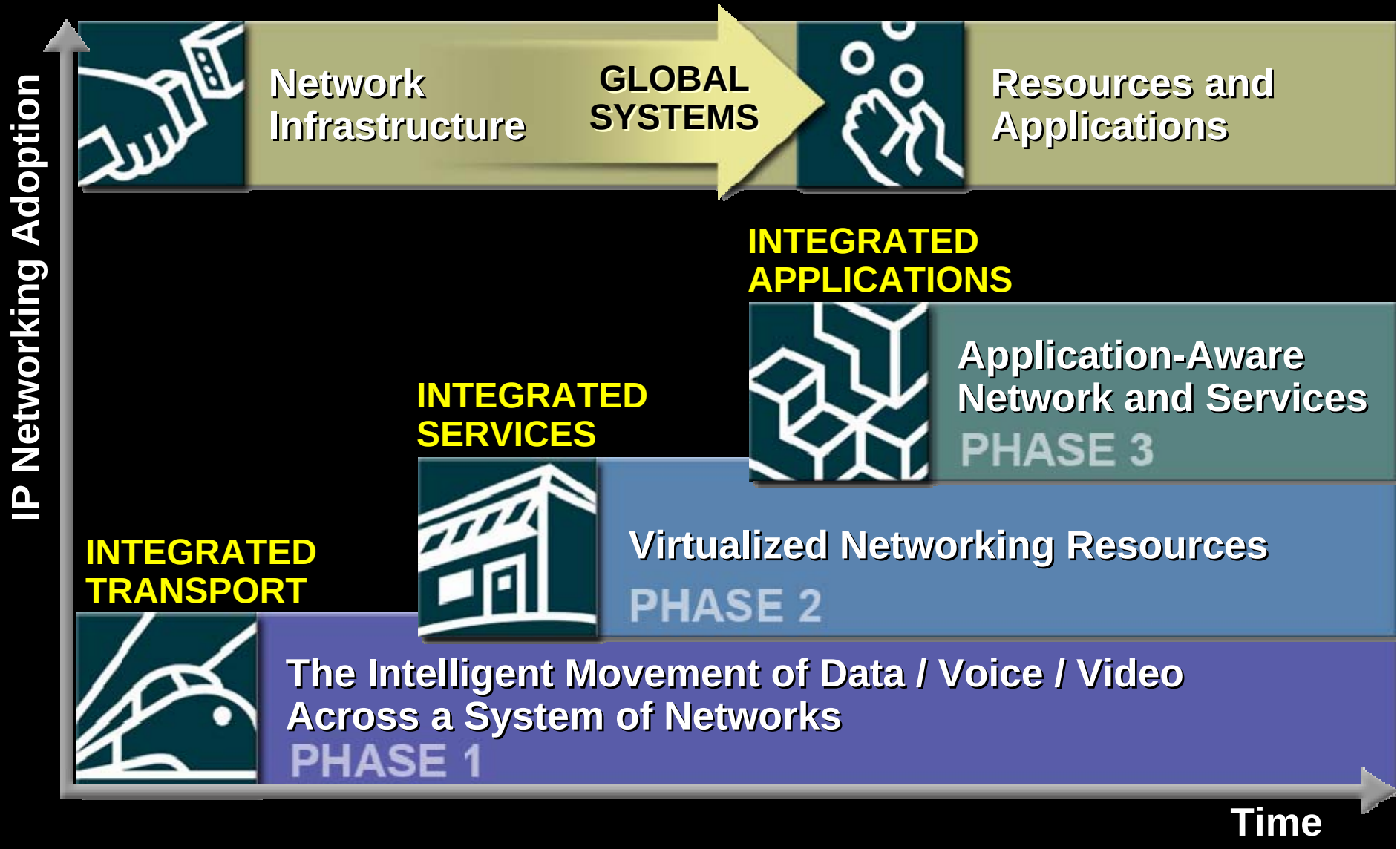
- Expansion of branch operations ??
- Revenue growth

You, the CIO and the CEO:
How to prepare

1. The Role of the CIO has never been more important

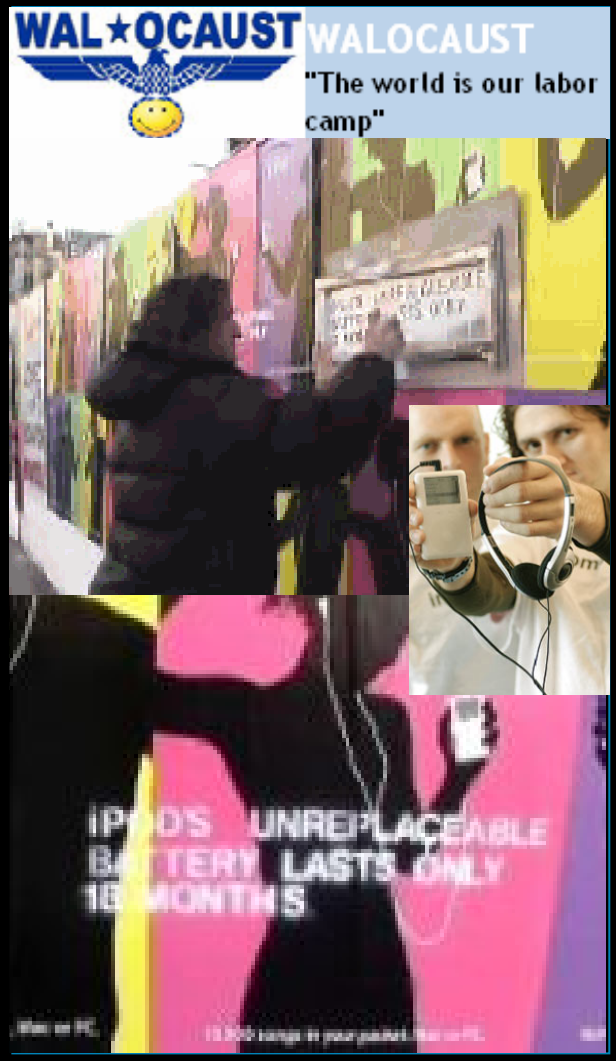


The Network will be platform



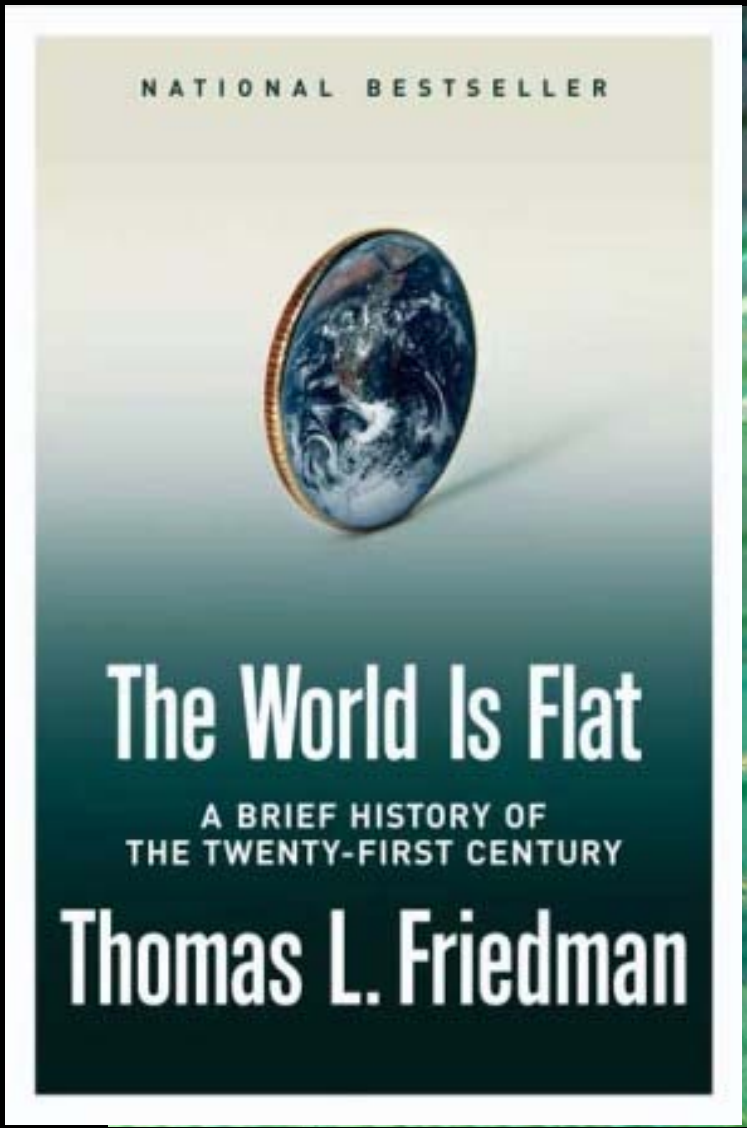
Security needs are taking on new forms
Brandalism: No Megaphone Required

- Definition
  - Consumer backlash at businesses that don't live up to brand image and customer expectations
  - "Brandals" deface or satirize ads and trademarks; set up critical sites and blogs
- Proof Points
  - Starwood, Apple, Ford (Ford Klansman)
- Impact
  - Social computing and multimedia tools rapidly attract angry customers and mainstream media; give brandals voice
- Thought Starter
  - Are you actively enaged in community forums, taking the pulse of your customer



2. Businesses and Governments Will Need to Adjust to More Rapid Change

- Historically, industrial changes took place over many years
  - The “Industrial Revolution” took centuries
  - The “Computer Revolution” took decades
- Now, technology is moving faster than many businesses are able to implement it
  - The “Internet Revolution” drives constant change
- The growth of Social Innovation



3. The Consumer is King/Queen : Customer Experience is the new competitive battleground

- Evolving Methods and Capabilities

  Online ordering and billing, built-to-order products, Internet-enabled manufacturing

- Evolving Customers

  Customers are more educated, have more choices and demand more services

  Customer become much less “sticky” – harder to attract and retain

- Evolving Business Models

  The Internet is driving down barriers to entry, allowing “upstart” threats and new business models

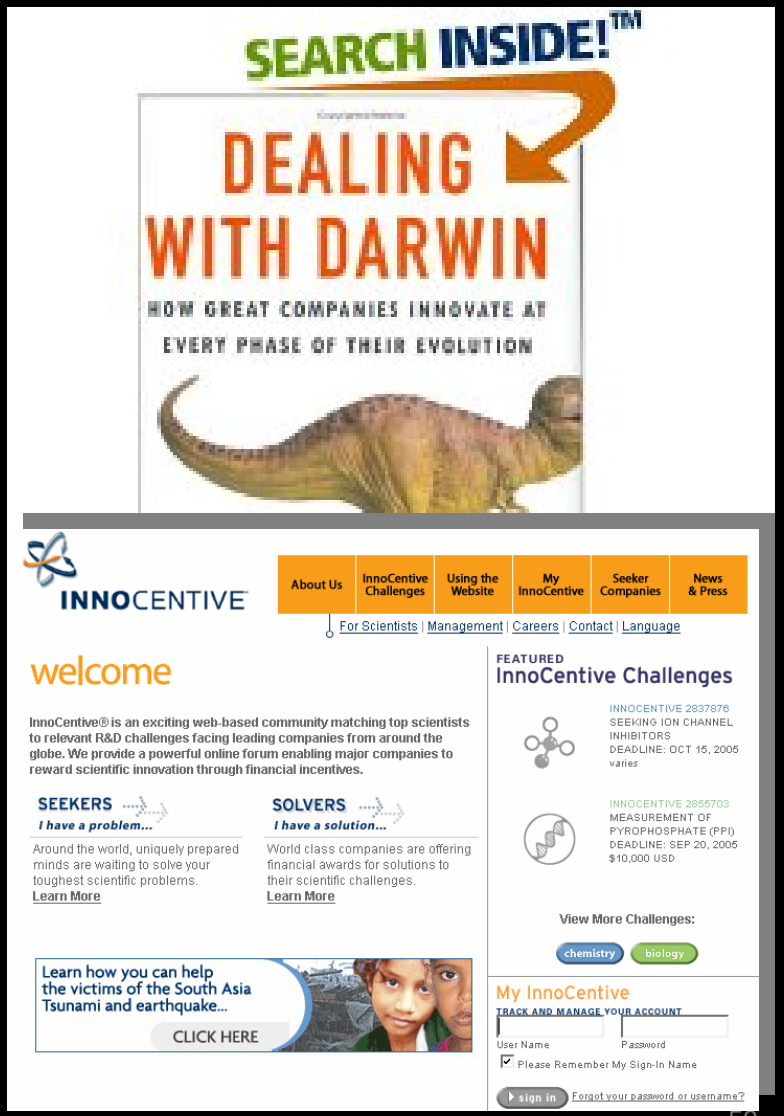
- Customer Experience is the new battleground

3. The requirement to Innovate will continue (forever)

"Innovate forever … is neither a slogan nor an aspiration; it is a requirement"

Geoffrey Moore, Dealing with Darwin 2005

- Architecture and culture that supports innovation
- Web 2.0 Strategy



4. Unlock the power of the human network

“ … under the right circumstances, groups are remarkably intelligent, and are often smarter than the smartest people in them ”

James Surowiecki 2005

- Create, align and share knowledge
- Open Innovation

Joseph Jaffe