VIRTUAL WORLDS, THE 3-D INTERNET, THE GRID, CLOUD COMPUTING, AND THE FUTURE OF THE NET

Michael R. Nelson
Visiting Professor, Internet Studies
Communication, Culture and Technology Program
Georgetown University
MNELSON@POBOX.COM

My Background

- B.S., geology, Caltech
- Ph.D., geophysics, MIT
- 1988 -- Congressional Science Fellow
- 4 years as Senator Gore's science advisor
- 4 years as IT policy wonk at White House
- 1998-1999 -- Technologist at FCC
- 9+ years at IBM
- Teaching at Georgetown since January

50 Things I learned in Washington

LESSON #1

ALWAYS have a good bumper sticker

50 Things I learned in Washington

LESSON #3

To make a point, you need two good, memorable "factoids"

50 Things I learned in Washington

LESSON #3

To make a point, you need two good, memorable "factoids"

(preferably true)

50 Things I learned in Washington

LESSON #5

State your conclusions upfront

Conclusions

- We are entering the third phase of the Internet
  - As profound as the World Wide Web
  - The next 2-3 years will define the Next Generation Internet
- Standards and business practices are shaping the Net as much—or more—than law and regulation
- The Internet revolution is less than 15% complete
  - Number of users
  - Total bandwidth
  - Total amount of content
  - Number of devices
  - Number of applications

50 Things I learned in Washington

LESSON #8

Always look beyond the headlines

HEADLINE #1 – Cloud Computing

THE HEADLINES

Google building huge data centers and offering Google Apps

Web 2.0

Flickr, YouTube, MySpace

SalesForce.com

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THE REAL NEWS

We're entering the 3rd phase of computing

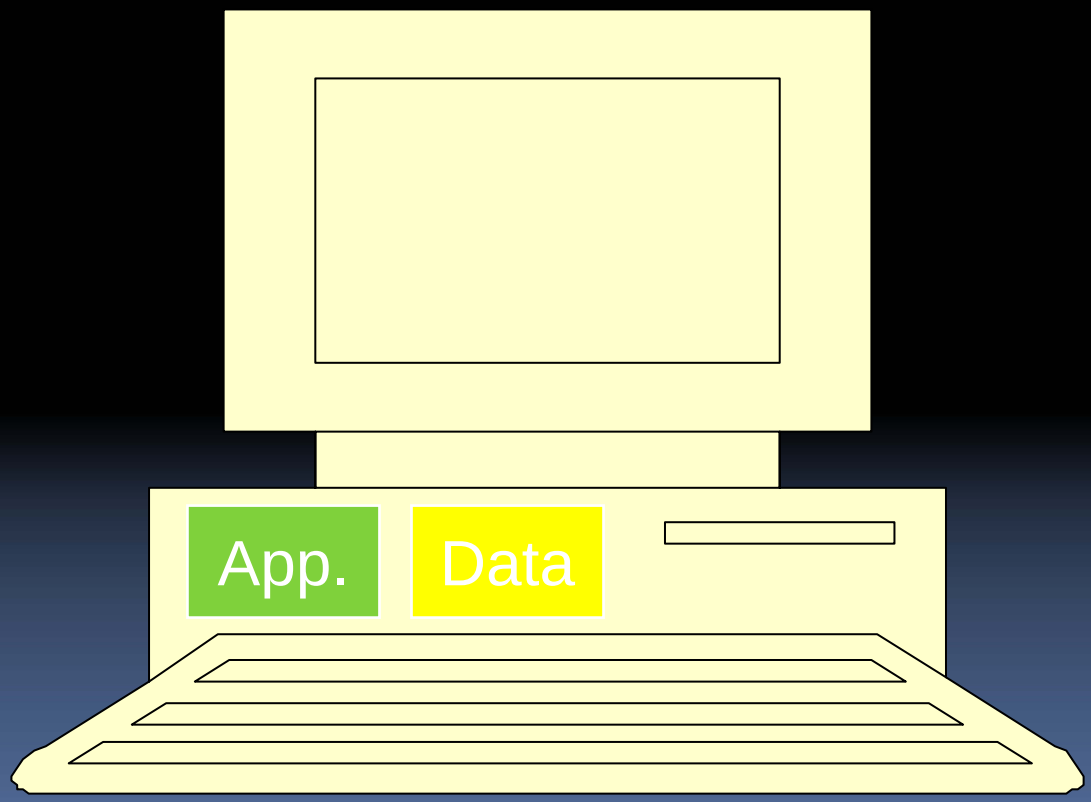
The Vision

- From Eric Schmidt, the CEO of Google:

  "We're moving into the era of 'cloud' computing, with information and applications hosted in the diffuse atmosphere of cyberspace rather than on specific processors and silicon racks. The network will truly be the computer."

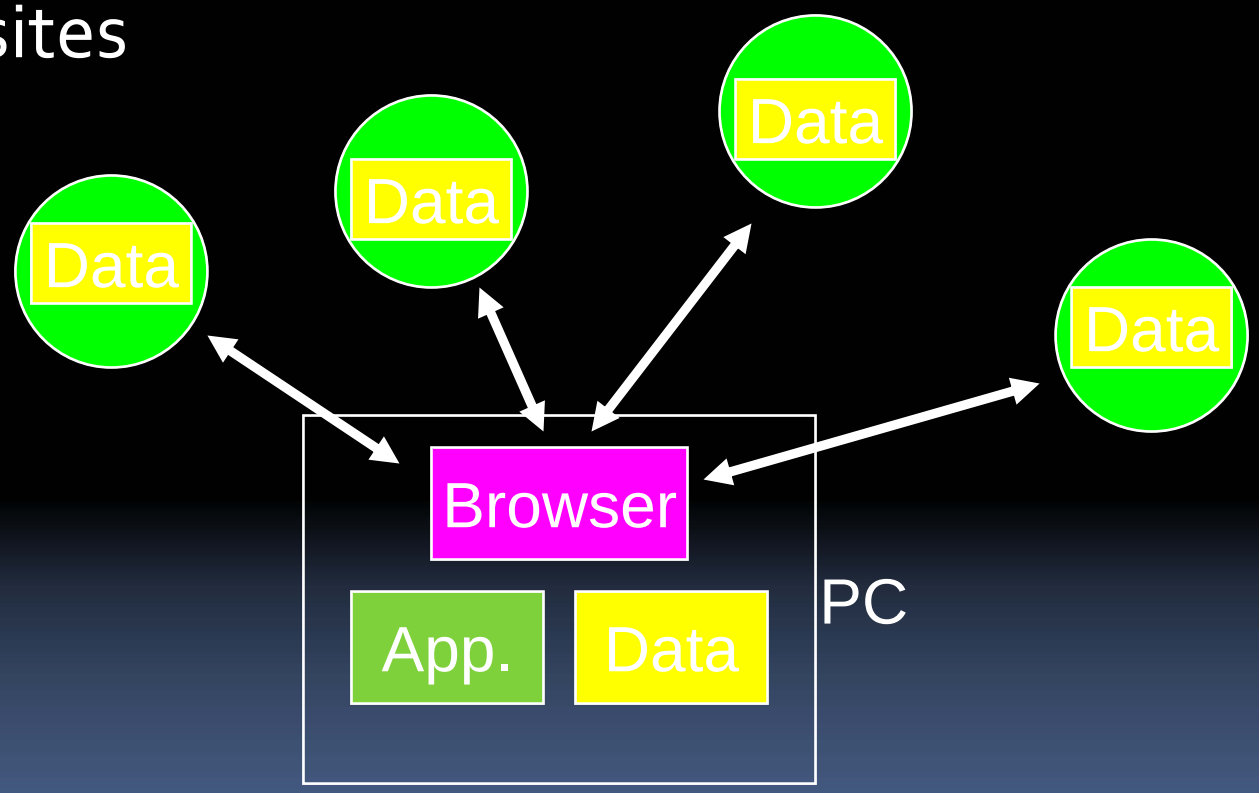
  ("Don't Bet Against the Internet," Economist, 2007)

Phase One – Stand Alone Computer

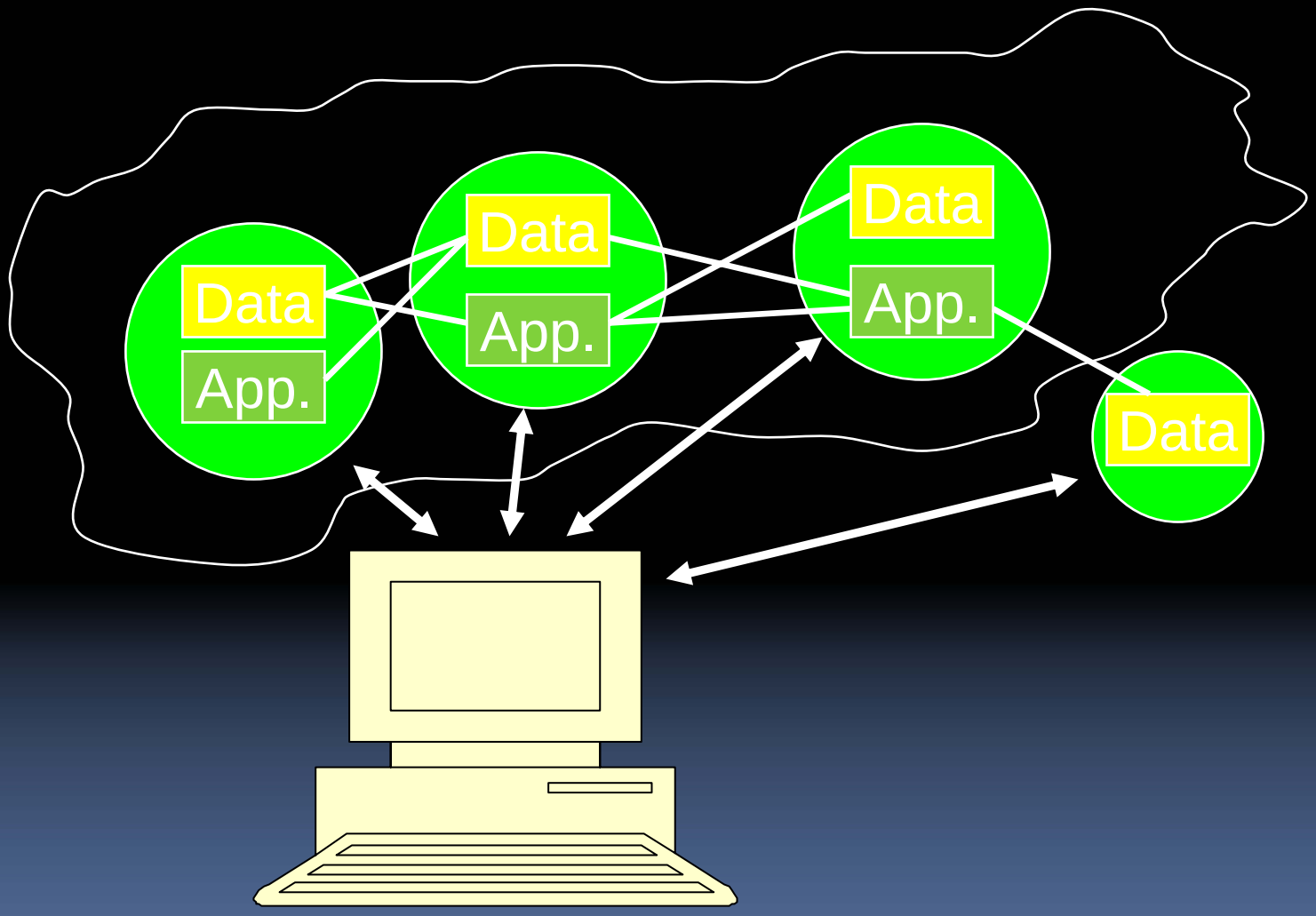


Phase Two – The Web

Web sites



Phase Three – The Cloud



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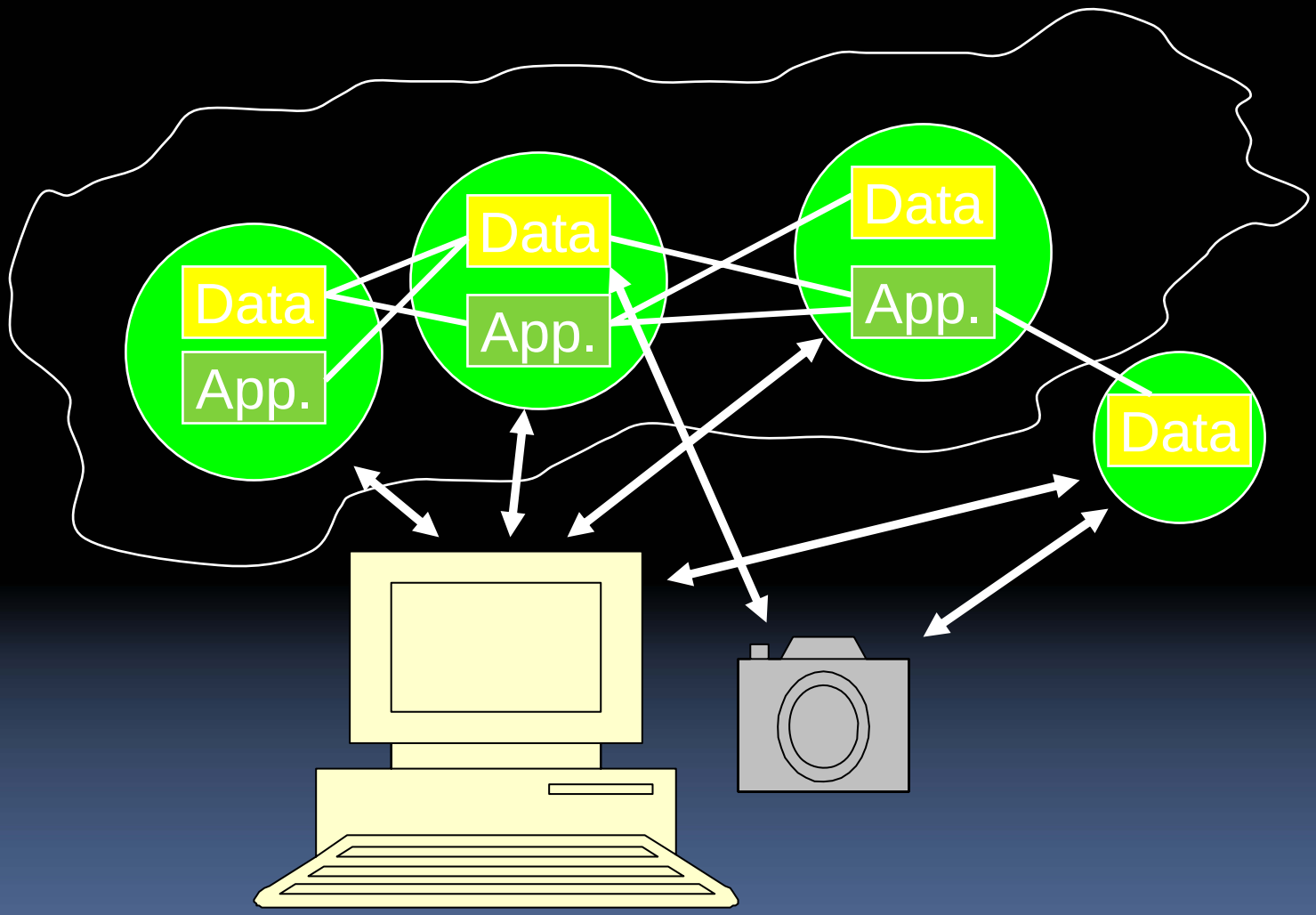

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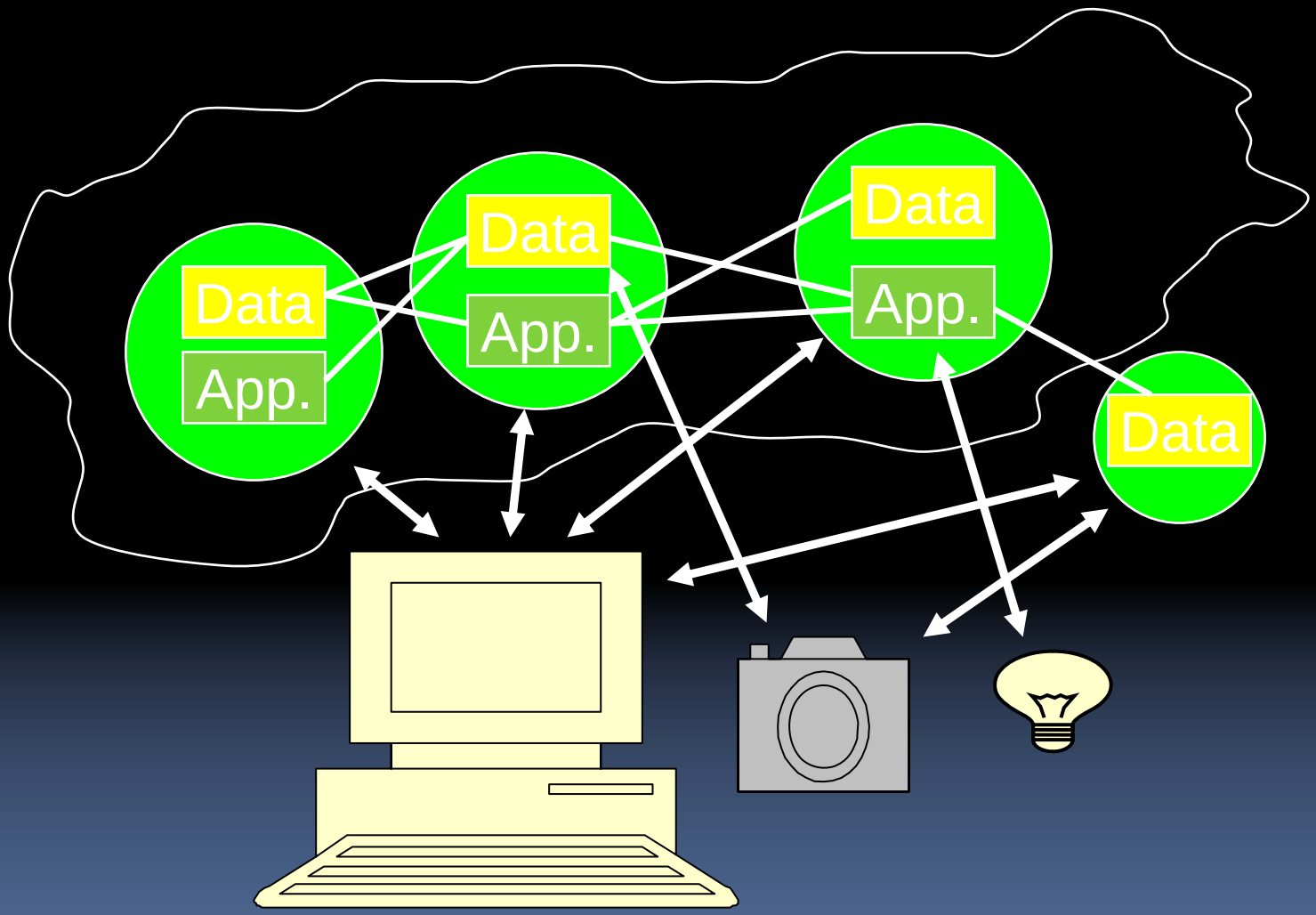

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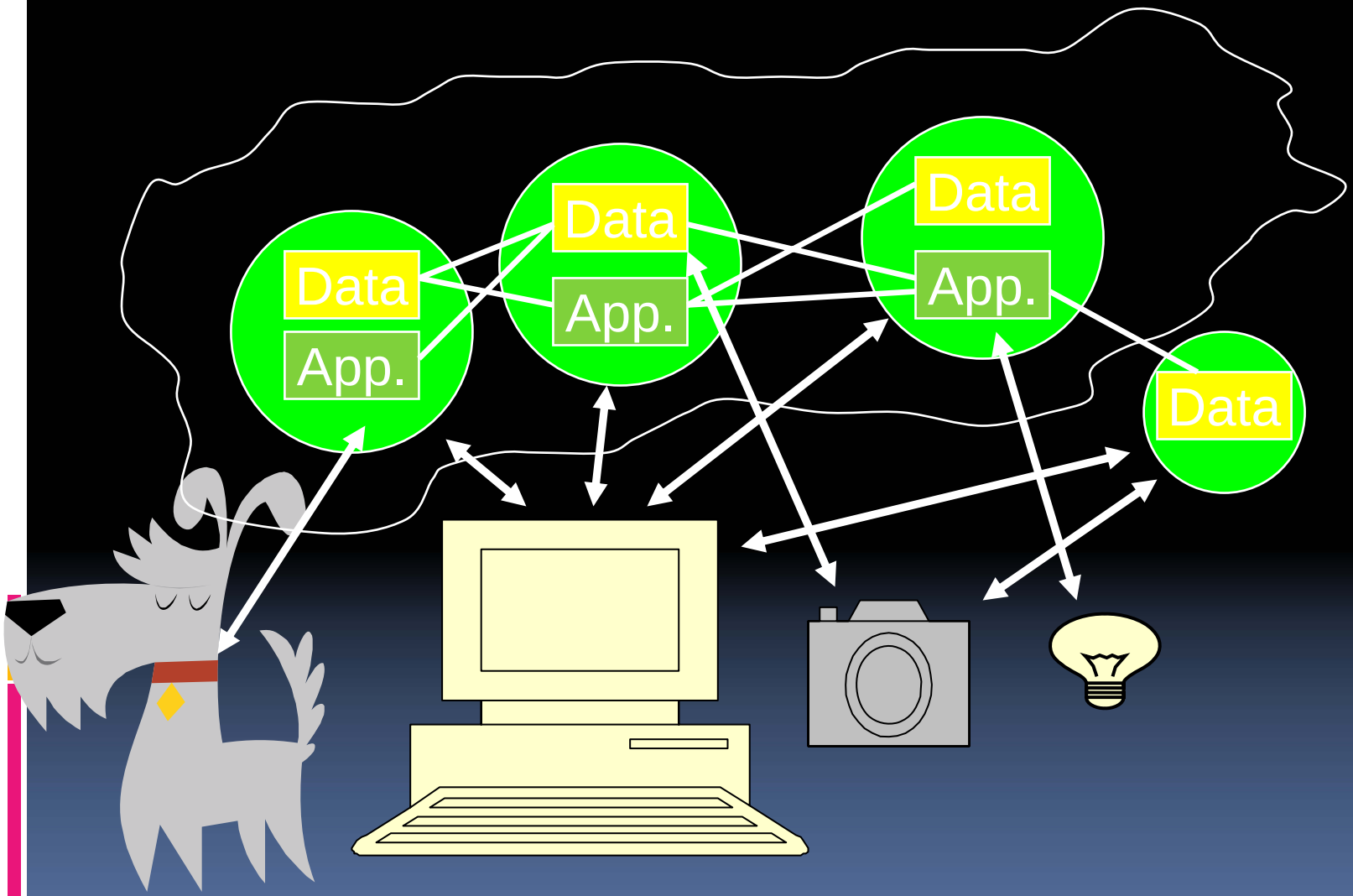


“The Big Switch” by Nicholas Carr

The Big Switch: Rewiring the World, from Edison to Google - Windows Internet Explorer

http://www.nicholasgcarr.com/bigswitch/

+"nicholas carr" +shift

The Big Switch: Rewiring the World, from Edison ...

HOME | BLOG | THE BIG SWITCH | DOES IT MATTER? | DIGITAL RENDERINGS | ARTICLES | SPEAKING

nicholas g carr

Excerpts:
"Where did the computer go?"
"Among the dynamos"
"A spider's web"

THE
BIG SWITCH

a Wall Street Journal bestseller

His last book shook up the high-tech industry. Now, Nicholas Carr is back with The Big Switch, *a sweeping and often disturbing look at how a new computer revolution is reshaping business, society and culture.*

A hundred years ago, companies stopped generating their own power with steam engines and dynamos and plugged into the newly built electric grid. The cheap power pumped out by electric utilities didn't just change how businesses operate. It set off a chain reaction of economic and social transformations that brought the modern world into existence. Today, a similar revolution is under way. Hooked up to the Internet's global computing grid, massive information-processing plants have begun pumping data and software code into our homes and businesses. This time, it's computing that's turning into a utility.

This is a VERY big deal

- **Gartner Says Cloud Computing Will Be As Influential As E-business**

  Special Report Examines the Realities and Risks of Cloud Computing

STAMFORD, Conn., June 26, 2008

HEADLINE #2 – Internet Video

THE HEADLINE

Warner Brothers, Fox offer TV shows (including "Desperate Housewives" on the Internet

Apple puts movies online

HEADLINE #3 - Grid

THE HEADLINE

TeraGrid and EGEE demonstrate

- >10 TeraOp/sec grids

IBM PetaOp/sec Clusters

HEADLINE #2 - Grid

THE HEADLINE

TeraGrid and EGEE demonstrate <10 TeraOp/sec grids

IBM PetaOp/sec Clusters

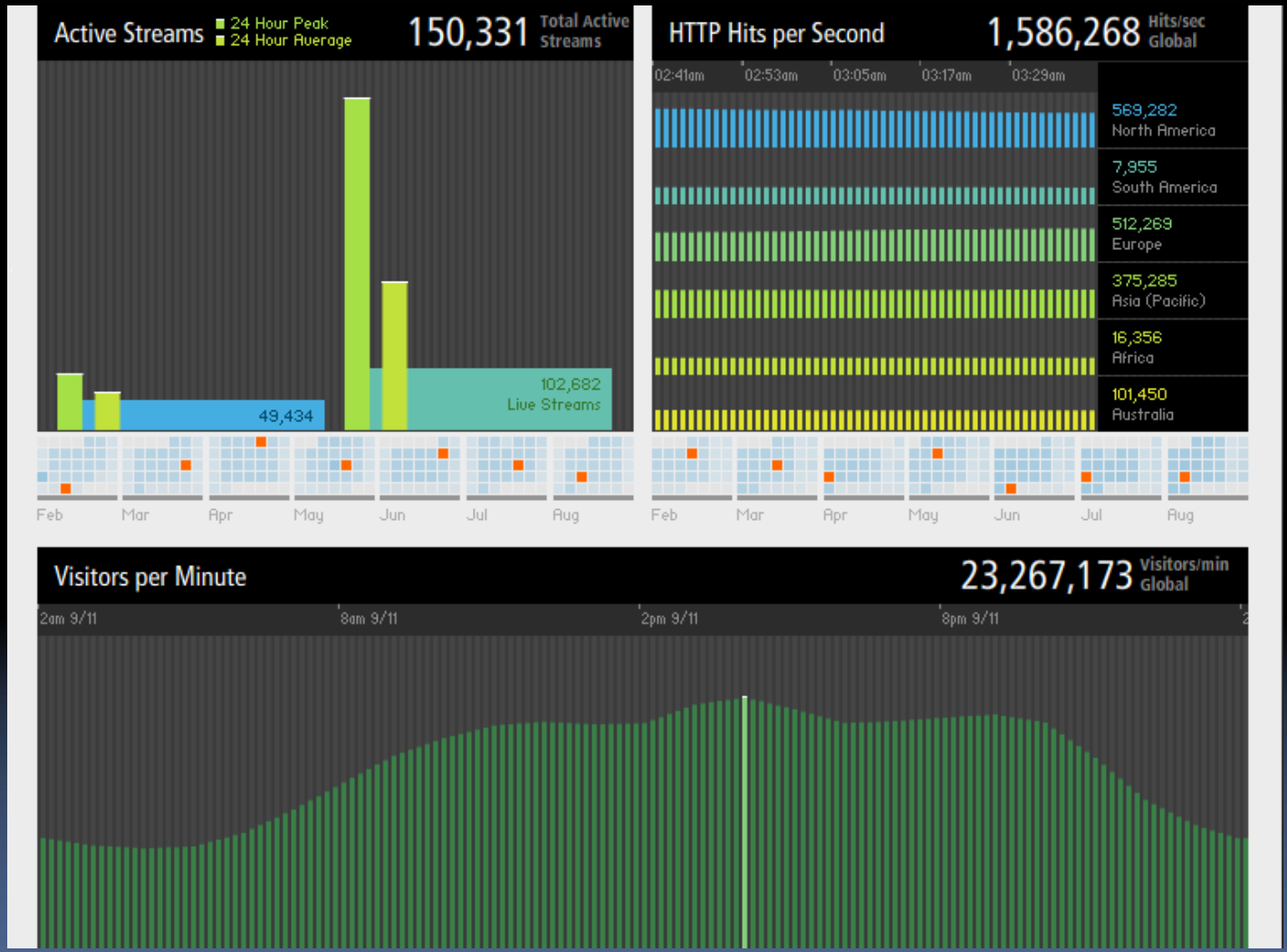
THE OTHER NEWS

Amazon's Elastic Compute Cloud

Akamai delivers 15-20 percent of Internet traffic (Physorg.com)

PC-based grids even more powerful

Akamai – Visualizing the Internet



http://www.akamai.com/html/technology/visualizing_akamai.html

PC-based Grids

- SETI @Home
- Berkeley Open Infrastructure for Network Computing
  - >684,000 users
  - >1,080,000 machines
- IBM's World Community Grid
  - >100,000 donors
  - >170,000 machines
- Fight AIDS @ Home
- Dozens of other projects
  - http://www.distributedcomputing.info/projects.html

Hacker attacks and mega spammers

Thousands of hackers making a living using zombies to send spam or run DDoS attacks

Take over 2000 PCs before breakfast

HEADLINE #3 – Internet Video

THE HEADLINE

Warner Brothers, Fox offer TV shows (including "Desperate Housewives" on the Internet

Apple puts movies online

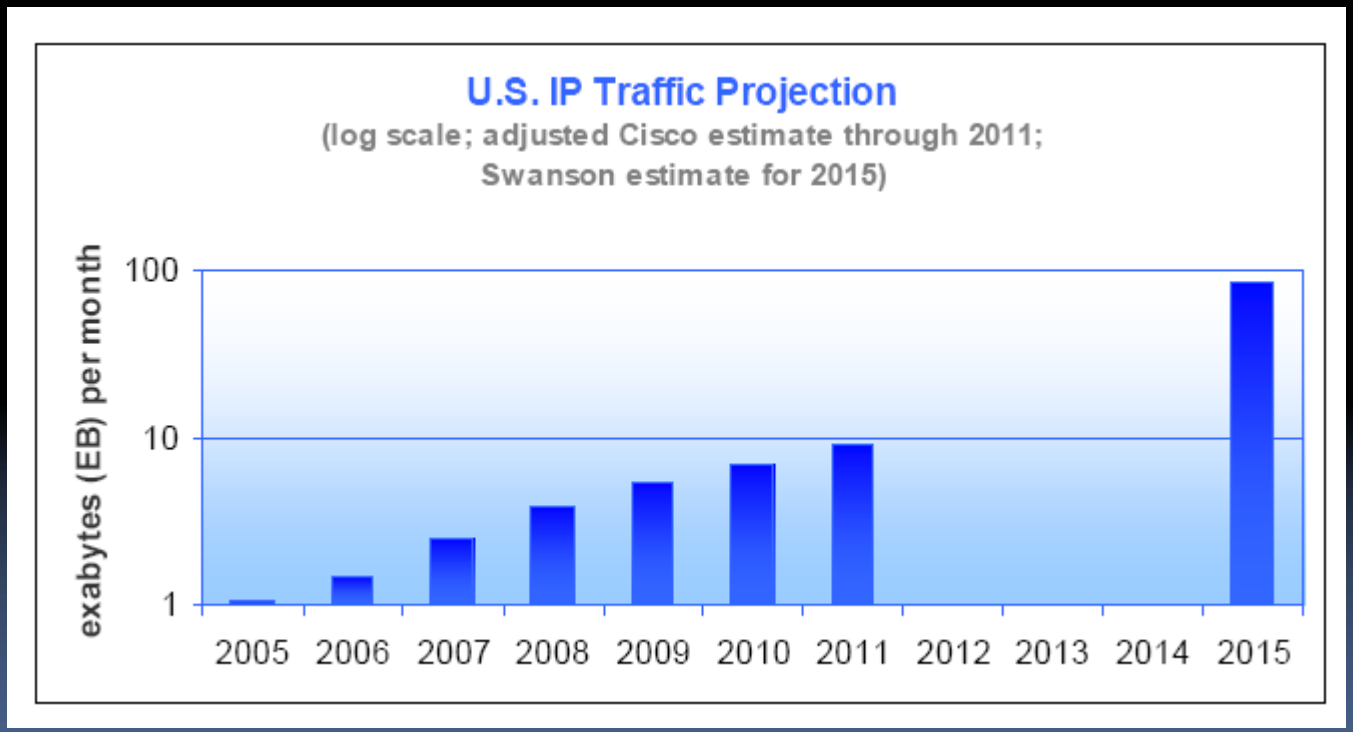
THE OTHER NEWS

Amateur and illegal video everywhere!

VIDEO EVERYWHERE

- TV shows, YouTube clips, animations, and other video applications already account for more than 60 percent of Internet traffic (CacheLogic)
- 80% of all traffic in some countries is video
- 98% of all traffic by 2009 (Hui Zhang, CMU)
- Amateur video
  - 100 million downloads/day on YouTube
  - Star Trek fan videos
  - Gaming videos
  - Webcams everywhere

Estimating the Exaflood
(Swanson and Gilder, 2008)



What's in the Exaflood?

Rough estimate of annual U.S. IP traffic, by application, circa 2015

Movie downloads and P2P	100 exabytes
Video calling and virtual windows	400 exabytes
"Cloud" computing / remote backup	50 exabytes
Internet video, gaming, virtual worlds	200 exabytes
Non-Internet "IPTV"	100 exabytes, or more
Business IP traffic	100 exabytes
Other (phone, Web, e-mail, photos, music)	50 exabytes
total	1,000 exabytes = **1 zettabyte**

HEADLINE #4 - Collaboration

THE HEADLINE

High-end video-conferencing (WebEx)

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THE HEADLINE

High-end video-conferencing (WebEx)

THE REAL NEWS

The Gaming Revolution + Virtual Worlds

- Producing GDP equivalent to Belgium's
- May 1 2006 Business Week cover story

Internet isn't just a medium, it's a PLACE

Early Virtual Worlds Business Applications

Commerce

Collaboration and Events

Education and Training

Other Emerging Applications

SO WHAT'S GOVERNMENT'S ROLE?

- Early adopter of new technologies (such as Virtual Worlds, Grid)

The Government Innovation Journey
(from Todd Ramsey, IBM, 2007)

Online Government

- *Web presence:* Information, search, e-mail

Wave 1

Interactive Government

- Intelligent infrastructure and portals
- *Government-Offering Centric:* Enable online transactions

Wave 2

Integrated Government

- Enterprise integration and transformation
- *Customer-centric:* Providing valued service to customers
- Multi-channel access and exchange

Wave 3

Extended Government

- Leverage the network / extend the enterprise
- Enhance value for all stakeholders
- *Flexible:* Cross-enterprise partnerships, integration, collaboration

Wave 4

Collaborative Government

- Prepare for and respond to unexpected situations
- Spontaneously tune service delivery to specific groups/needs
- *Adaptive:* Processes respond to a wide range of individual needs and situations

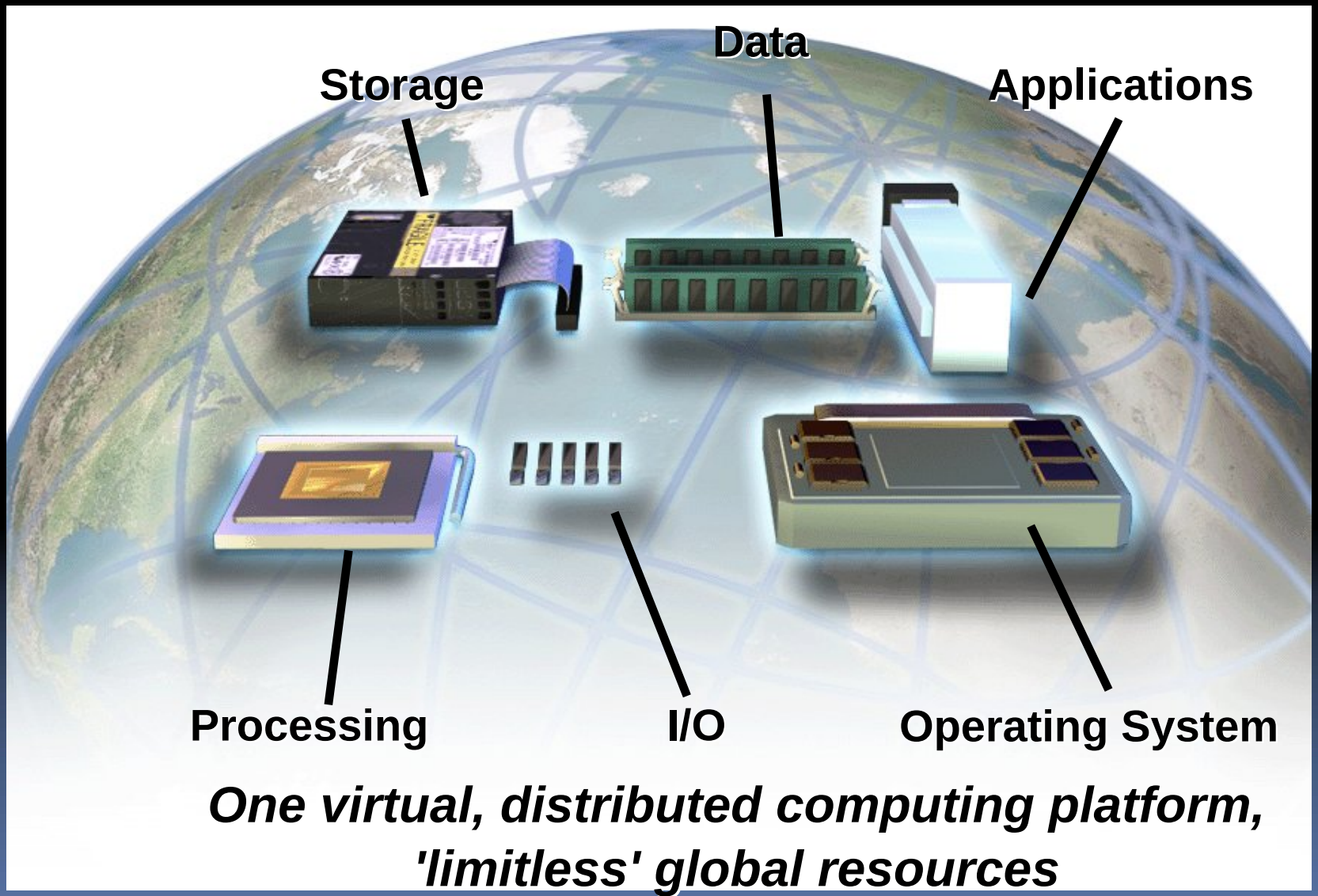
Wave 5

ACCESS → INTEGRATION → ON DEMAND

SO WHAT'S GOVERNMENT'S ROLE?

- Early adopter of new technologies
  (such as Virtual Worlds, Grid)
- Promote competition and investment in telecom infrastructure
- Enable new access technologies (e.g. WiMax)
- Education and training
- Foster open standards and open source software
- Help create a foundation for a secure Internet
- "Future proof" your policies

Policies for the Cloud



Critical technology choices

- Authentication and directories
- Open Document Format
- Privacy-enhancing technologies (P3P)
- Digital Rights Management
- Filtering technologies to block spam, porn
- Voice over IP
- Wireless Internet standards
- Service-Oriented Architecture (SOA) and Grid computing
- Instant messaging
- IPv6 deployment
- Linking the phone network and the Internet
- Rich media standards (SIP, multicast, etc.)
- End-to-end vs. walled gardens

EXAMPLE 1 - Authentication

THE HEADLINE

Microsoft CardSpace, Liberty Alliance

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THE HEADLINE

Microsoft CardSpace, Liberty Alliance

THE OTHER NEWS

Open source, open standards, federated identity management gets real

MIT's Technology Review Top 10 technologies

Authentication: The situation today

Authenticated through:

Devices
(PC, Cellphone, PDA)

Browser

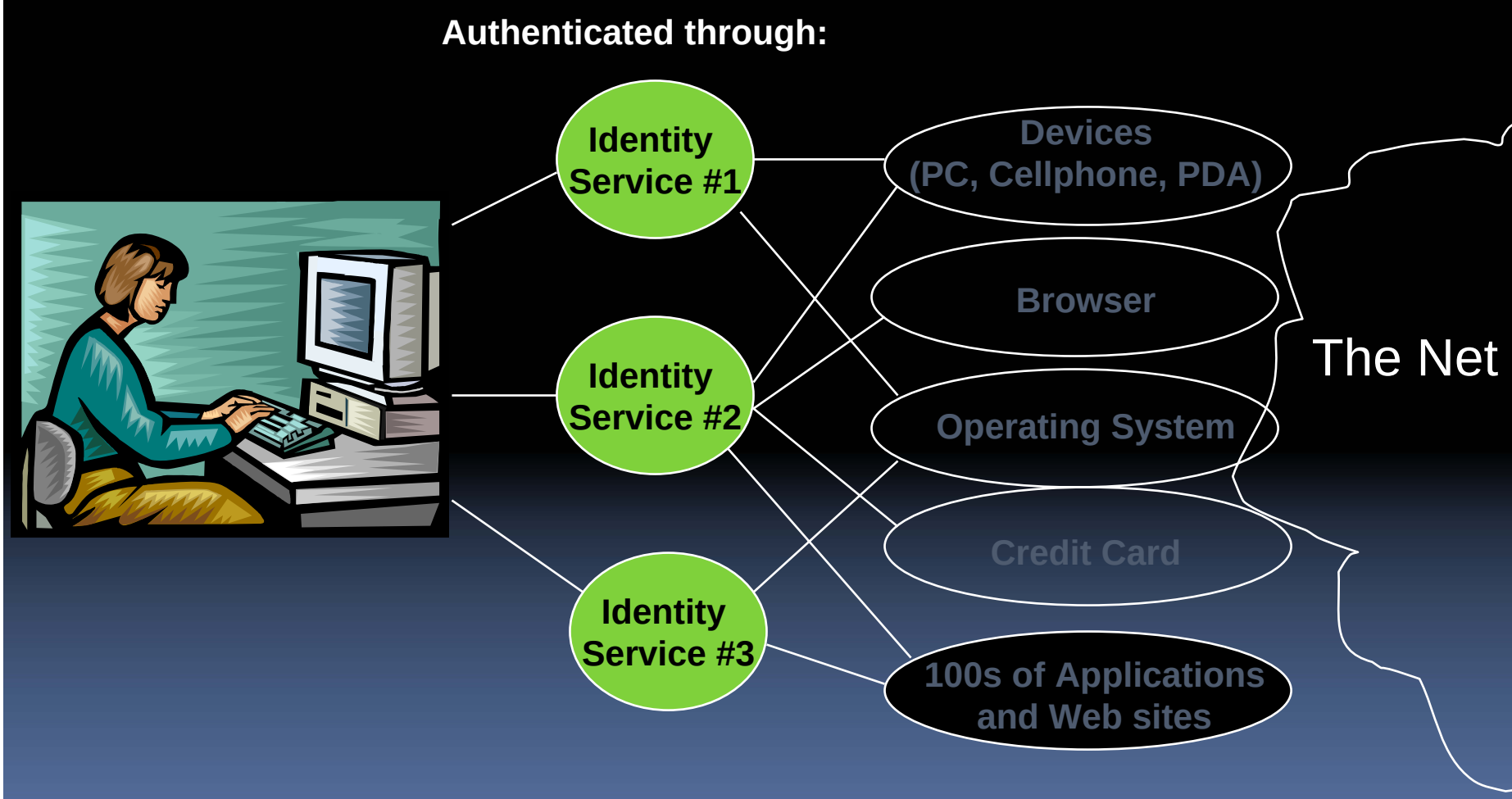
Operating System

Credit Card

100s of Applications
and Web sites

The Net

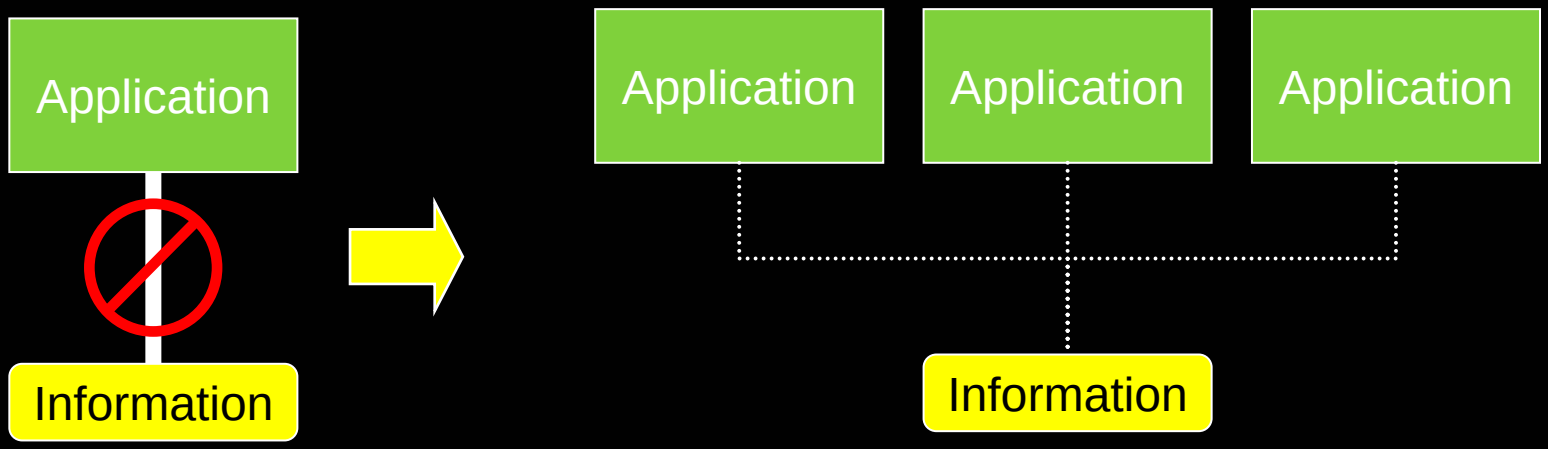
Open Authentication: The situation tomorrow?



EXAMPLE 2 - ODF, Open Document Format

- An XML-based specification describing the content and formatting of a document.
- The open standard developed by a multi-vendor committee at OASIS and an ISO standard.
- The standard that meets the common test for openness, including IBM's.
- The default document format in StarOffice, Open Office, KOffice, IBM Lotus Notes.
- The open standard adopted by many vendors.
- The option that gives you the most choices for interoperability and future-proofing your information.

ODF is an example of a bigger change



Old Style

Information is closely linked to the application that created it.

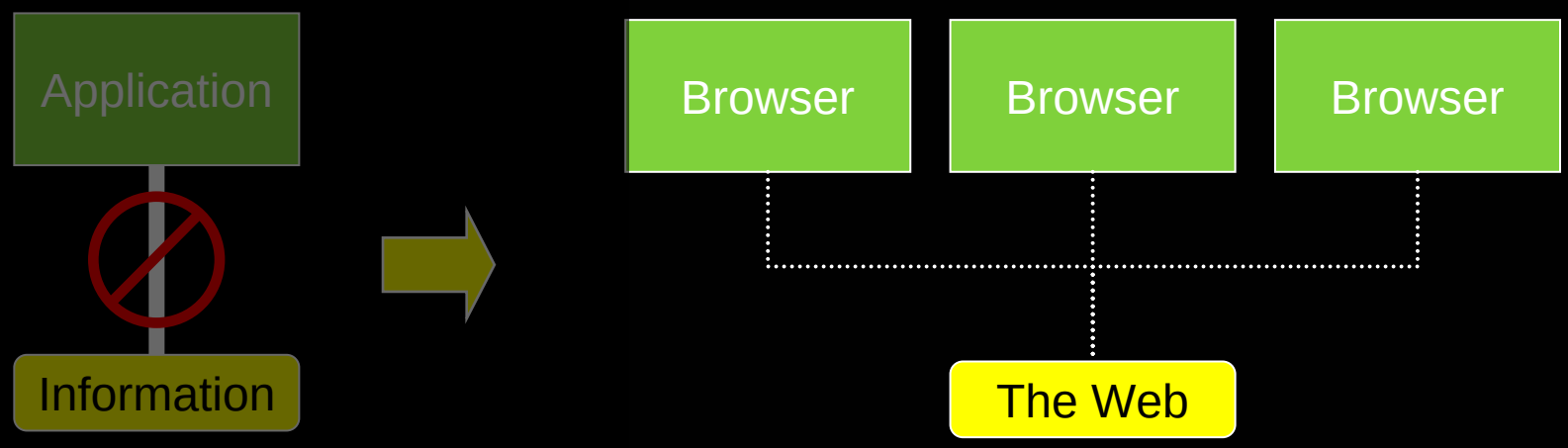
Control is with the software developer *not* the customer.

New Style

Information is represented using a real open standard not under the control of a single vendor, and multiple applications can create and access it interchangeably.

Control is with the customer *not* the software provider.

We started to see this in the 1990s



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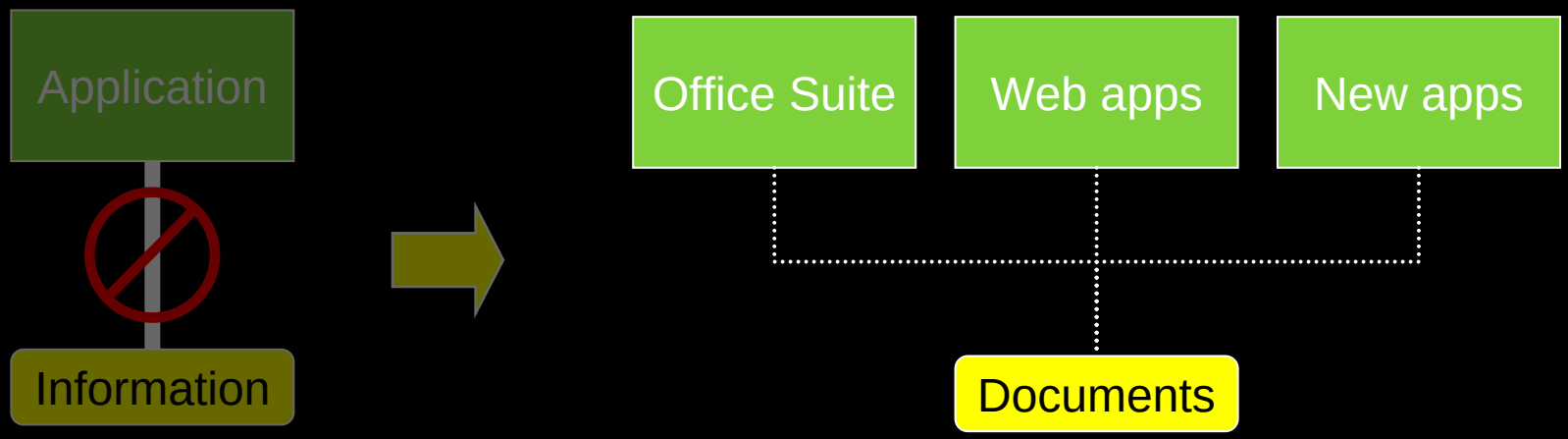
The trend will accelerate in the 2000s



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Roles for government (cont.)

- Foster open standards
- Education and training
  - Skills for dealing with the Exaflood
    - "Is Google making Us Stupid?"
    - "Unloading Information Overload," 7/7/08, WSJ
  - Next generation library science

Conclusions

- The Internet Revolution is less than 15% complete
- The Internet Revolution will be as disruptive as the printing press, but:
  - Much faster
  - Totally global
  - More unpredictable
- When in doubt, empower the user!