

User Interaction: Ubiquitous Computing in the age of the Cloud

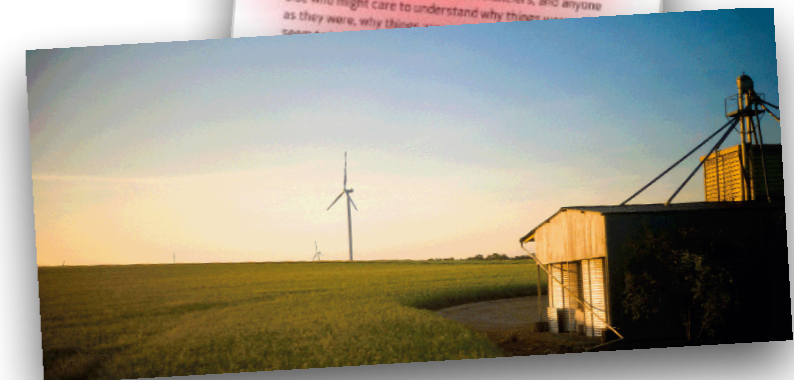
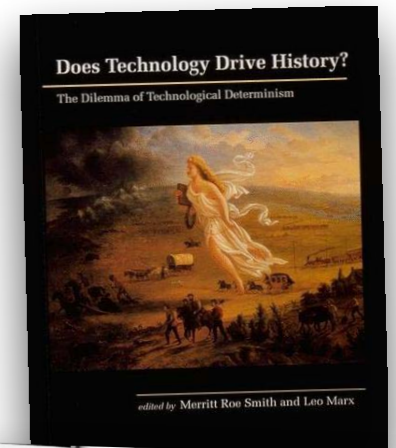
Associate Professor Donald J. Patterson
INF 133 Fall 2014



- We use narratives to help us to make sense of technology
- They help us figure out what makes sense as the next step and what “progress” is
- Different narratives can be contradictory but not necessarily wrong
- Some narratives are wrong because they don't account for things that we can observe

4 Narrative Visions of the Future of IT

- Technological Determinism
- Ubiquitous Computing
- Sterling Transitions
- Collapse Informatics




: What is Ubiquitous Computing?

ubiq·ui·tous  *adj* \yü-'bi-kwə-təs\
+1 

Definition of UBIQUITOUS

: existing or being everywhere at the same time : constantly encountered : WIDESPREAD <a *ubiquitous* fashion>

- **ubiq·ui·tous·ly** *adverb*
- **ubiq·ui·tous·ness** *noun*

 See [ubiquitous](#) defined for English-language learners »
See [ubiquitous](#) defined for kids »

Examples of UBIQUITOUS

- The company's advertisements are *ubiquitous*.
- <by that time cell phones had become *ubiquitous*, and people had long ceased to be impressed by the sight of one>
- Hot dogs are the ideal road trip food—inexpensive, portable, *ubiquitous*. —Paul Lucas, *Saveur*, June/July 2008

[+] more

www.merriam-webster.com

: The origins of Ubicomp as a academic discipline

The Computer

by Mark Weiser

Today this technology is ubiquitous in industrialized countries. Not only do books, magazines and newspapers convey written information, but so do street signs, billboards, shop signs and even graffiti. Candy wrappers are covered in writing. The constant background presence of these products of "literacy technology" does not require active attention, but the information to be transmitted is ready for use at a glance. It is difficult to imagine modern life otherwise.

Silicon-based information technology, in contrast, is far from having become part of the environment. More than 50 million personal computers have been sold, and the computer nonetheless remains largely in a world of its own. It

MARK WEISER is head of the Computer Science Laboratory at the Xerox Palo Alto Research Center. He is working on the next revolution of computing after workstations, variously known as ubiquitous computing or embodied virtuality. Before working at PARC, he was a professor of computer science at the University of Maryland; he received his Ph.D. from the University of Michigan in 1979. Weiser also helped found an electronic publishing company and a video arts company and claims to enjoy computer programming "for the fun of it." His most recent technical work involved the implementation of new theories of automatic computer memory reclamation, known in the field as garbage collection.

at the Xerox Palo Alto Research Center think that the idea of a "personal" computer itself is misplaced and that the vision of laptop machines, dynabooks and "knowledge navigators" is only a transitional step toward achieving the real potential of information technology. Such machines cannot truly make computing an integral, invisible part of people's lives. We are therefore trying to conceive a new way of thinking about computers, one that takes into account the human world and allows the computers themselves to vanish into the background.

Such a disappearance is a fundamental consequence not of technology but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading. Computer scientist, economist and Nobelist Herbert A. Simon calls this phenomenon "compiling"; philosopher Michael Polanyi calls it the "tacit dimension"; psychologist J. J. Gibson calls it "visual invariants"; philosophers Hans Georg Gadamer and Martin Heidegger call it the "horizon" and the "ready-to-hand"; John Seely Brown of PARC calls it the "periphery." All say, in essence, that only when things disappear in this way are we freed to use them without thinking and so to focus beyond them on new goals.

Indeed, the opposition between the analogy with writing, carrying a superlaptop is like owning just one very important book. Customizing this book, even writing millions of other books, does not begin to capture the real power of literacy.

Furthermore, although ubiquitous computers may use sound and video in addition to text and graphics, that does not make them "multimedia computers." Today's multimedia machine makes the computer screen into a demanding focus of attention rather than allowing it to fade into the background.

Perhaps most diametrically opposed to our vision is the notion of virtual reality, which attempts to make a world inside the computer. Users don special goggles that project an artificial scene onto their eyes; they wear gloves or even bodysuits that sense their motions and gestures so that they can move about and manipulate virtual objects. Although it may have its purpose in allowing people to explore realms otherwise inaccessible—the insides of cells, the surfaces of distant planets, the information web of data bases—virtual reality is only a map, not a territory. It excludes desks, offices, other people not wearing goggles and bodysuits, weather, trees, walks, chance encounters and, in general, the infinite richness of the universe. Virtual reality focuses an enormous apparatus on simulating the world rather than on invisibly enhancing the world that already exists. Indeed, the opposition between the



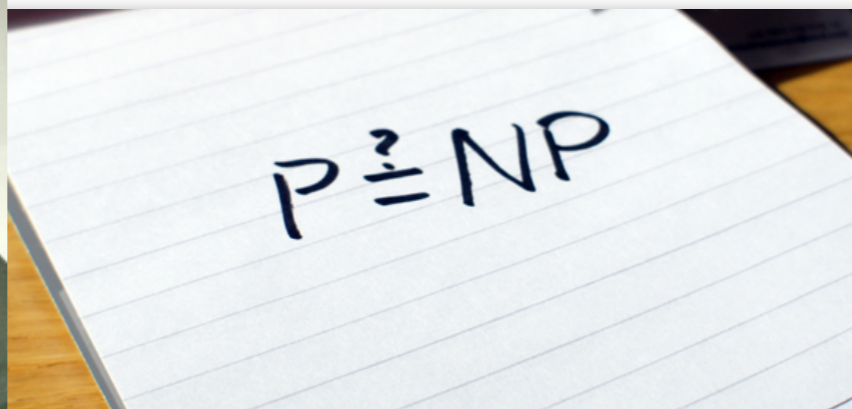
UBIQUITOUS COMPUTING begins to emerge in the form of live boards that replace chalkboards as well as in other devices at the Xerox Palo Alto Research Center. Computer scientists gather around a live board for discussion. Building boards

and integrating them with other tools has helped researchers understand better the eventual shape of ubiquitous computing. In conjunction with active badges, live boards can customize the information they display.



Zero Wave

- Computerless Computing
 - 1930-1940
 - Computers are theoretical technology
 - Church and Turing establish fundamental limits on computability





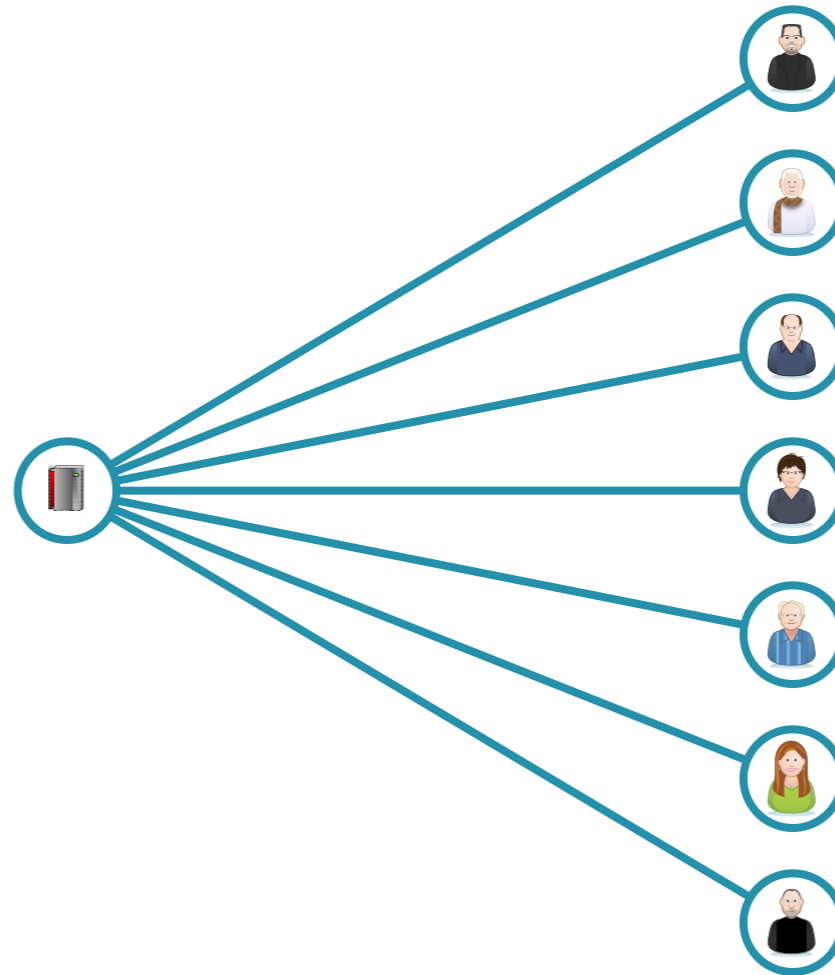
First Wave

- Main Frame Computing
 - 1960-1970
 - Massive computers to do simple data processing
 - Few computers in the world



: Ubicomp is about people's relationship to computers

First Wave





Second Wave

- Desktop Computing
 - 1980-1990
 - Business applications drive usage
 - One computer per desk
 - Computers connected in intranets to a massive global network
 - All wired



: Ubicomp is about people's relationship to computers

Second Wave





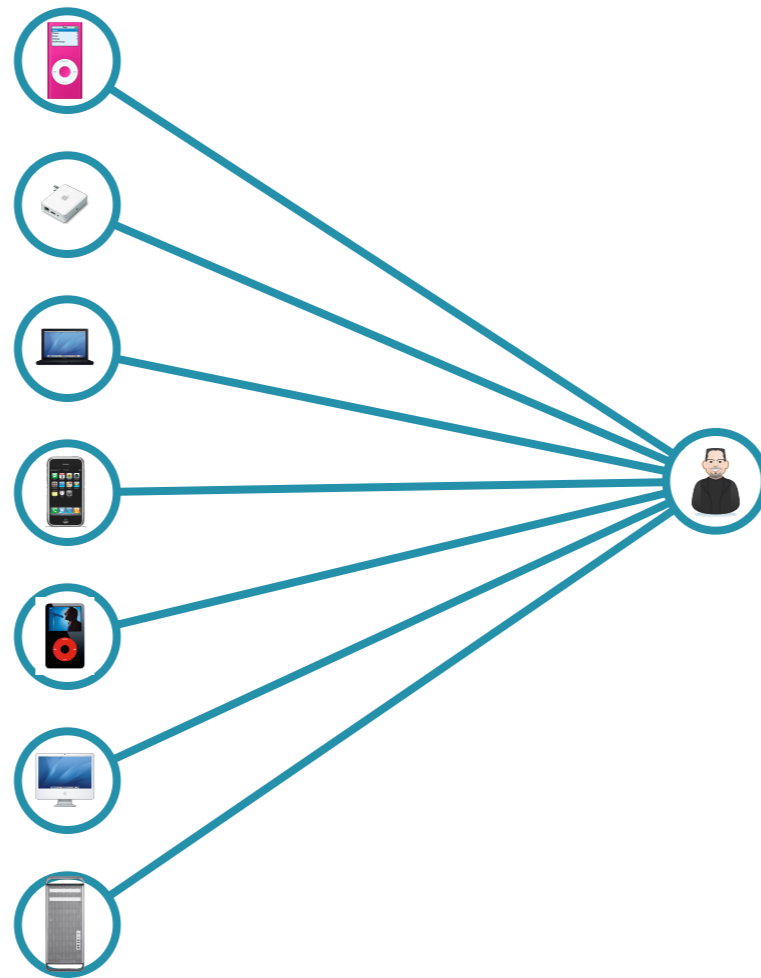
Third Wave

- Ubiquitous Computing
 - 2000 - present
 - Information creation, access, communication drive usage
 - Multiple computers per environment/person
 - WANs, LANs, PANs, ad-hoc networking, wireless
 - Computers disappearing



: Ubicomp is about people's relationship to computers

Third Wave



Ubicomp is about people's relationship to computers

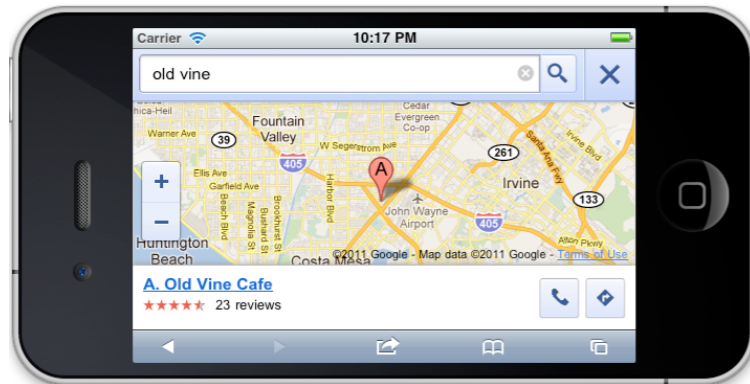
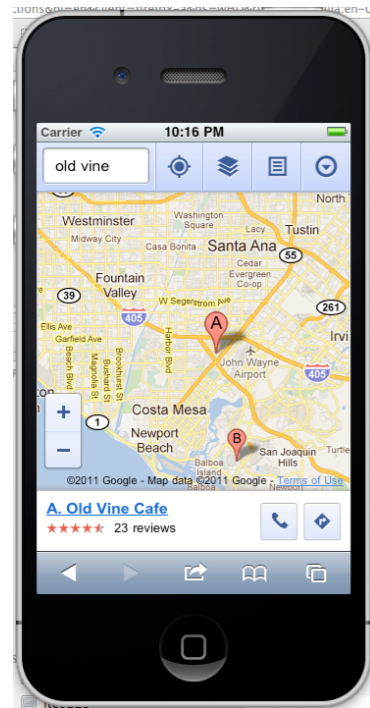
- virtual reality
 - humans enter the computers world
- ubiquitous computing
 - computers enter the human's world

: Ubicomp is about people's relationship to computers

Ubicomp ————— Augmented Reality ————— Virtual Reality

Virtual Worlds

Mirror Worlds



ar photo, vr photo, green photo

Summary

- Technologies are becoming more embedded, seamless and “invisible”
- Technology progresses in waves based on scale

Freeband Video

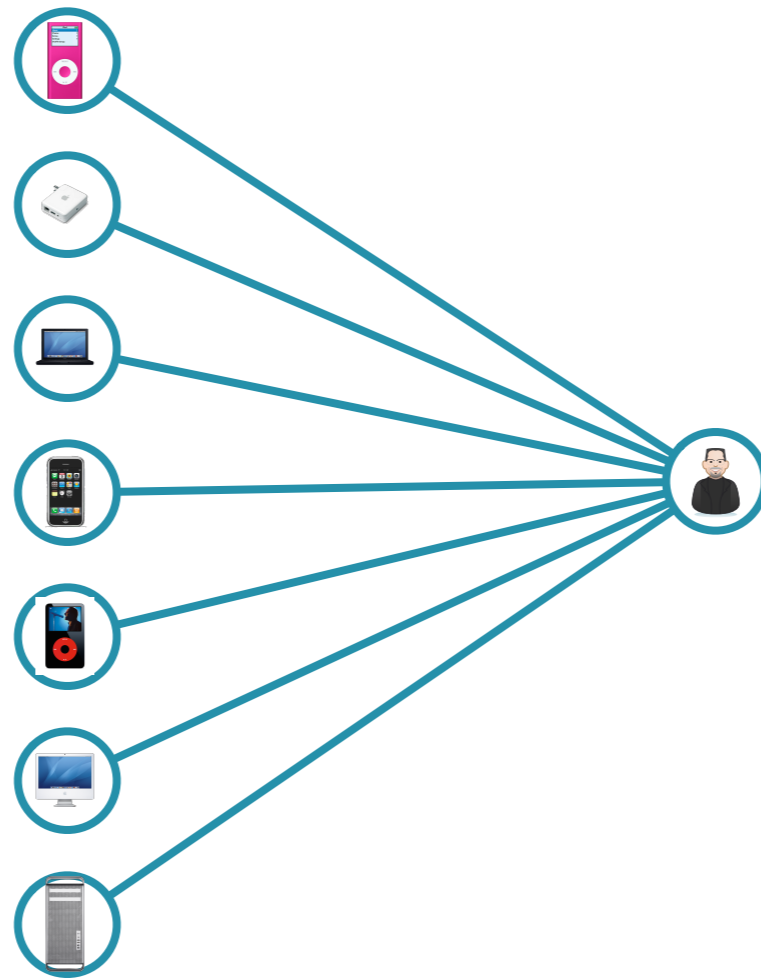
- Technologies are becoming more embedded, seamless and “invisible”
- Technology progresses in waves based on scale

What is the 4th wave?

Is ubiquitous computing
the same as cloud
computing?

: Ubicomp is about people's relationship to computers

Third Wave



How are we going to manage all of these devices?

Who is going to manage all of these devices?

Who is going to manage the infrastructure when the computers enter the human's world?

The professionals!

Enter cloud computing....

Cloud computing

is several

{visions, architectures, infrastructures}

that transform computing from a

{capital investment, product}

into a

{utility, service}



Cloud computing
is an
infrastructure
that transform computing from a
capital investment
into a
utility



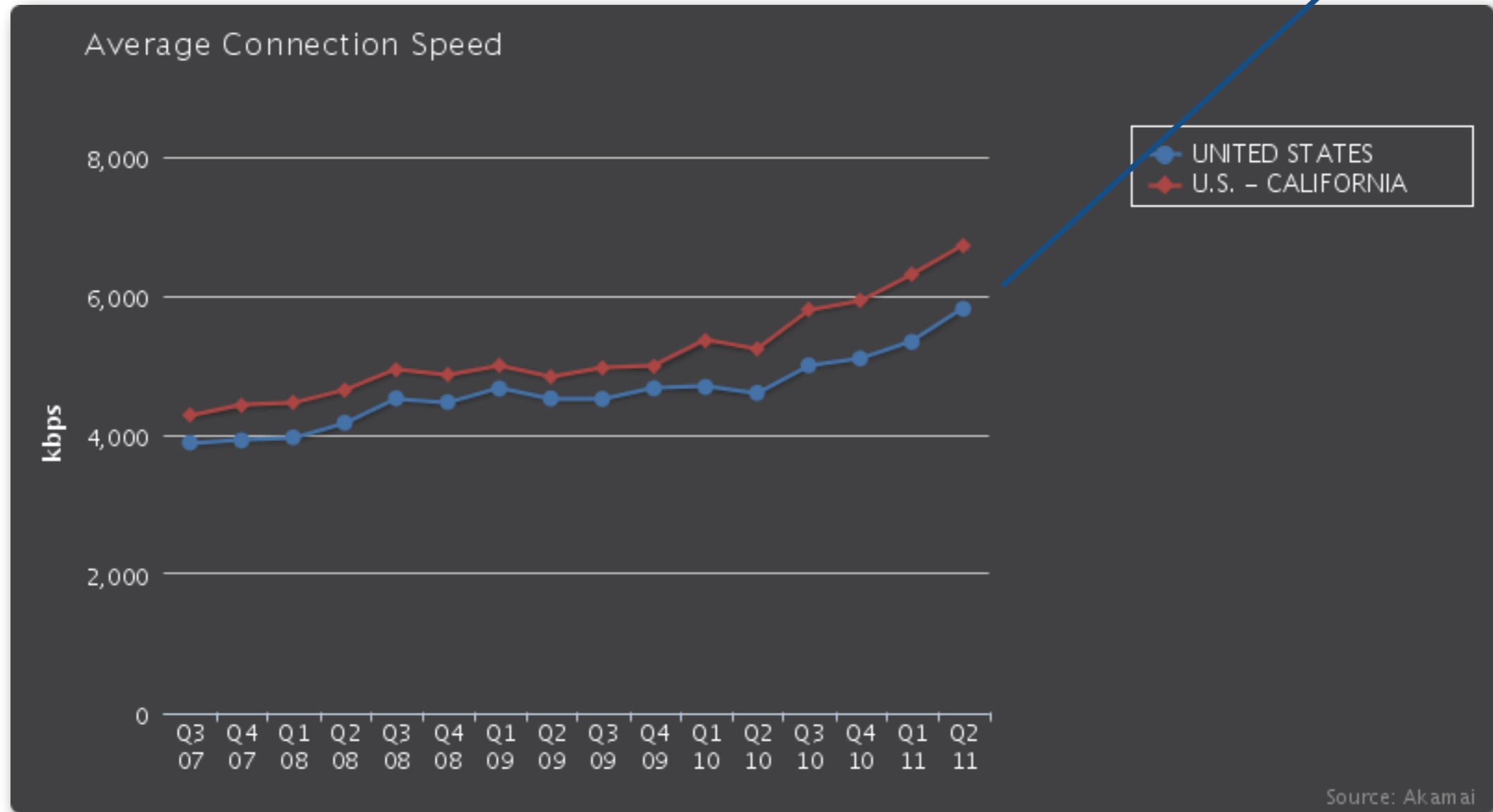
Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications



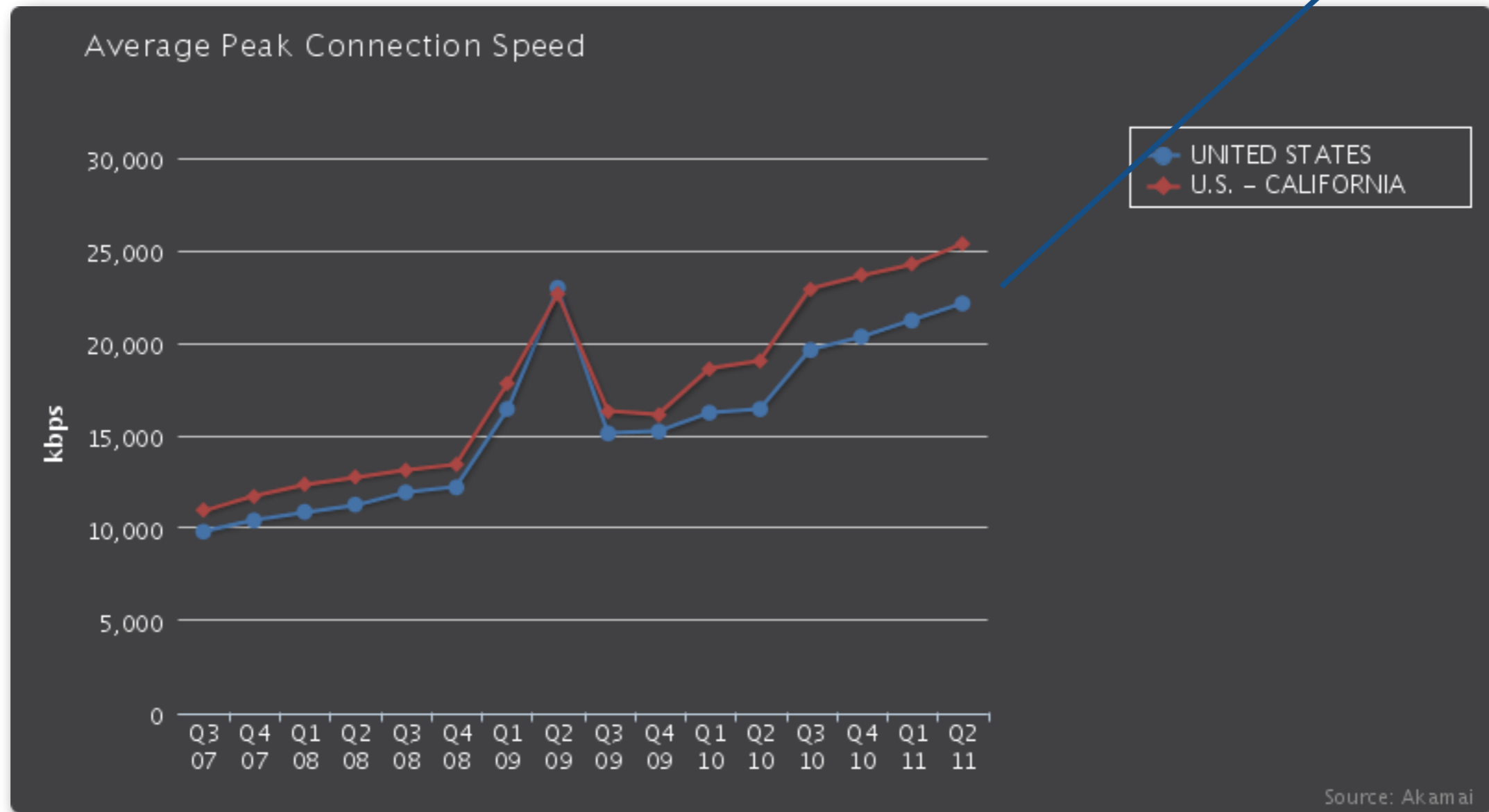
Connectivity

Q2 '14 US = 11,400 ★



Connectivity

Q2 '14 US = 45,300 ★



Which country has the fastest mobile broadband?

South Korea

(15.2 Mbps average Q2 '14)

Australia

(108.0 Mbps highest average peak connection speed Q2 '14)

“average connection speeds increased by more than 100% year-over-year at 22 mobile providers” (2011)

-akamai

Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications





The mobile penetration divide

In some parts of Africa, five people share the same phone. In Italy, almost every adult has at least two mobile devices. How penetration varies by region,

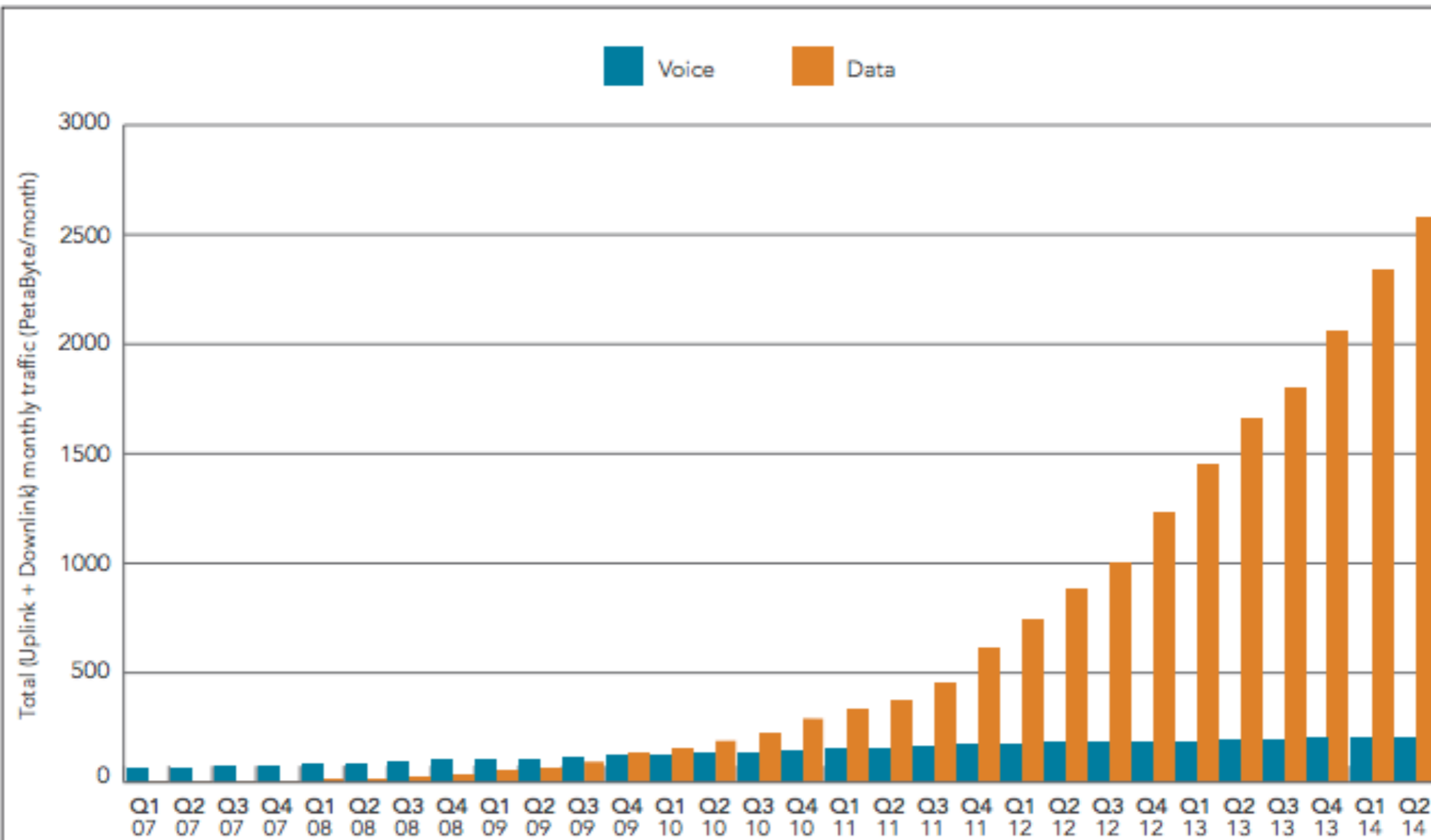


Figure 40: Total Monthly Mobile Voice and Data as Measured by Ericsson

Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications



Virtualization Technology



Windows 7 Running in a Virtual Machine on a Mac

Virtualization Technology

Commercial



Open Source



Powers Amazon,
Rackspace, Linode, etc.

What is virtualization good for?

- Efficiency
 - Fully utilize “bare-metal” host hardware
 - Suddenly 8 cores seems reasonable
- Portability
 - Move a virtual machine to another host
 - Perhaps without telling anyone
- Isolation
 - One machine doesn't effect another
- Run multiple OS's at the same time
- Supports disposal computers

Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications





China, U.S., Israel

- **Pros**
 - Nation states
 - Very smart people
 - Unlimited Resources
 - Motivated by political/military goals
- **Semi-pros**
 - Organized crime
 - Motivated by money
- **Amateurs**
 - Motivated by bragging rights

Anonymous,
LulzSec

Security Threats

	Country/Region	Q2 '14 Traffic %	Q1 '14 %
1	China	43%	41%
2	Indonesia	15%	6.8%
3	United States	13%	11%
4	Taiwan	3.7%	3.4%
5	India	2.1%	2.6%
6	Russia	2.0%	2.9%
7	Brazil	1.7%	3.2%
8	South Korea	1.4%	1.6%
9	Turkey	1.2%	1.7%
10	Romania	1.2%	1.6%
-	Other	16%	25%

Figure 1: Attack Traffic, Top Originating Countries (by source IP address, not attribution)

Port	Port Use	Q2 '14 Traffic %	Q1 '14 %
80	WWW (HTTP)	15%	8.0%
445	Microsoft-DS	14%	14%
23	Telnet	10%	8.7%
443	SSL (HTTPS)	7.7%	2.9%
1433	Microsoft SQL Server	6.7%	2.3%
8080	HTTP Alternate	5.5%	1.5%
3389	Microsoft Terminal Services	4.3%	2.8%
22	SSH	3.4%	2.0%
3306	MySQL	2.1%	0.5%
135	Microsoft-RPC	1.9%	1.0%
Various	Other	29%	-

Figure 2: Attack Traffic, Top Ports

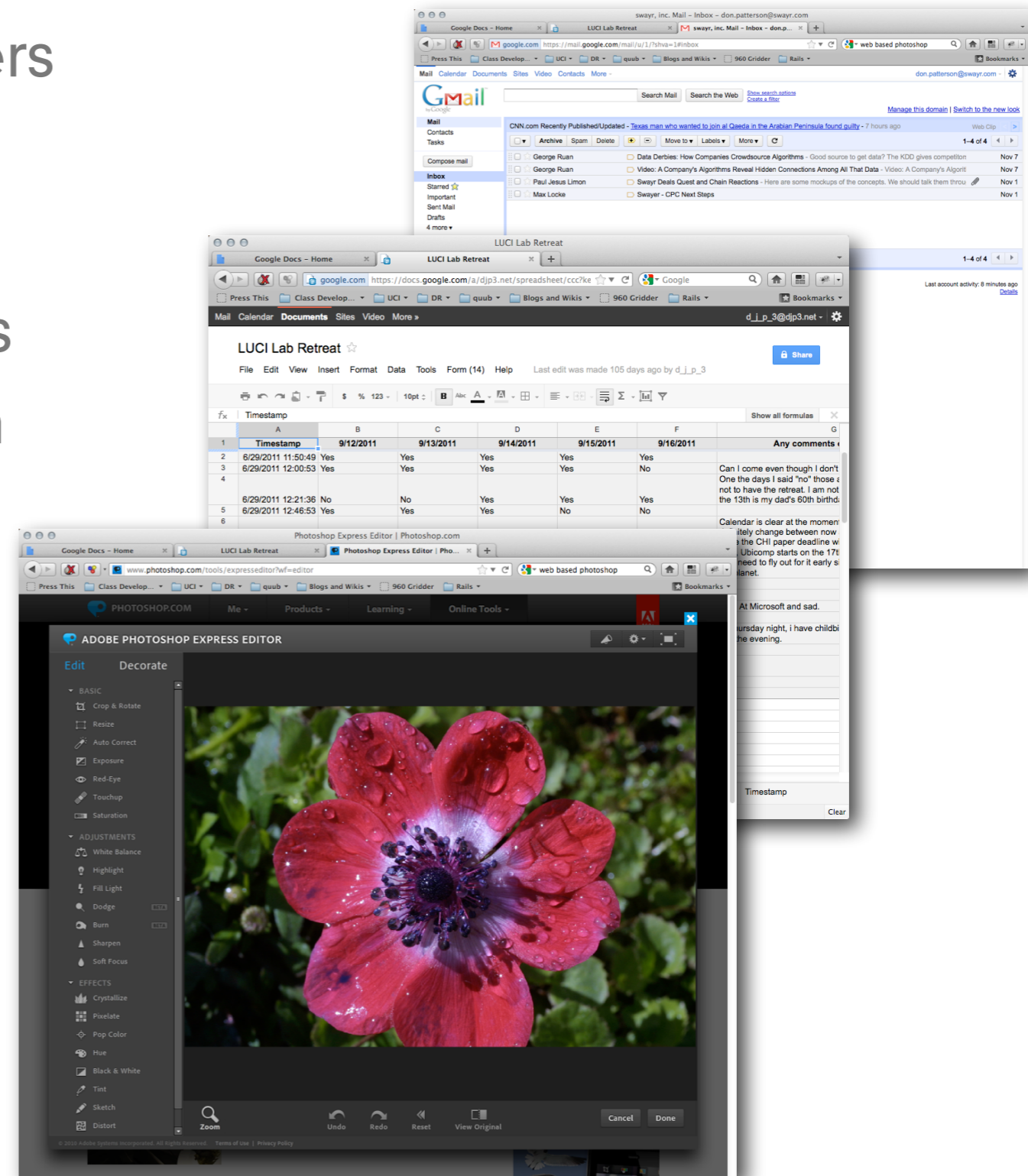
Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications



Sentient browser applications

- Sentient Applications
 - Programs that people spend time working with
- Enabled by modern browsers
 - Offline storage
 - Web sockets
 - Real-time push updates
 - Real-time collaboration
 - Fast client-side Javascript
- Examples
 - Hotmail
 - Google Docs
 - Photoshop Express



Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications

I can always reach any computer in the world at high-speed wirelessly

So, now the landscape has changed



Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications

I have a device in my pocket that can be a decent interface to any other computer in the world

So, now the landscape has changed



Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications

It is very cheap to run powerful computers in consolidated data centers

So, now the landscape has changed



Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications

It requires professionals to keep computers and data secure when being attacked by sophisticated enemies

So, now the landscape has changed



Why now? What has changed?

- Connectivity
- Smart phones
- System Virtualization
- Security Threats
- Sentient browser applications

I don't need to be able to run a program natively. I'd rather run the latest program released every day.

So, now the landscape has changed



Why now? What has changed?

- First wave
 - It was cheaper to share a mainframe
- Second wave
 - It was cheaper to have your own desktop
- Third wave
 - It is cheaper to rent computation from the cloud

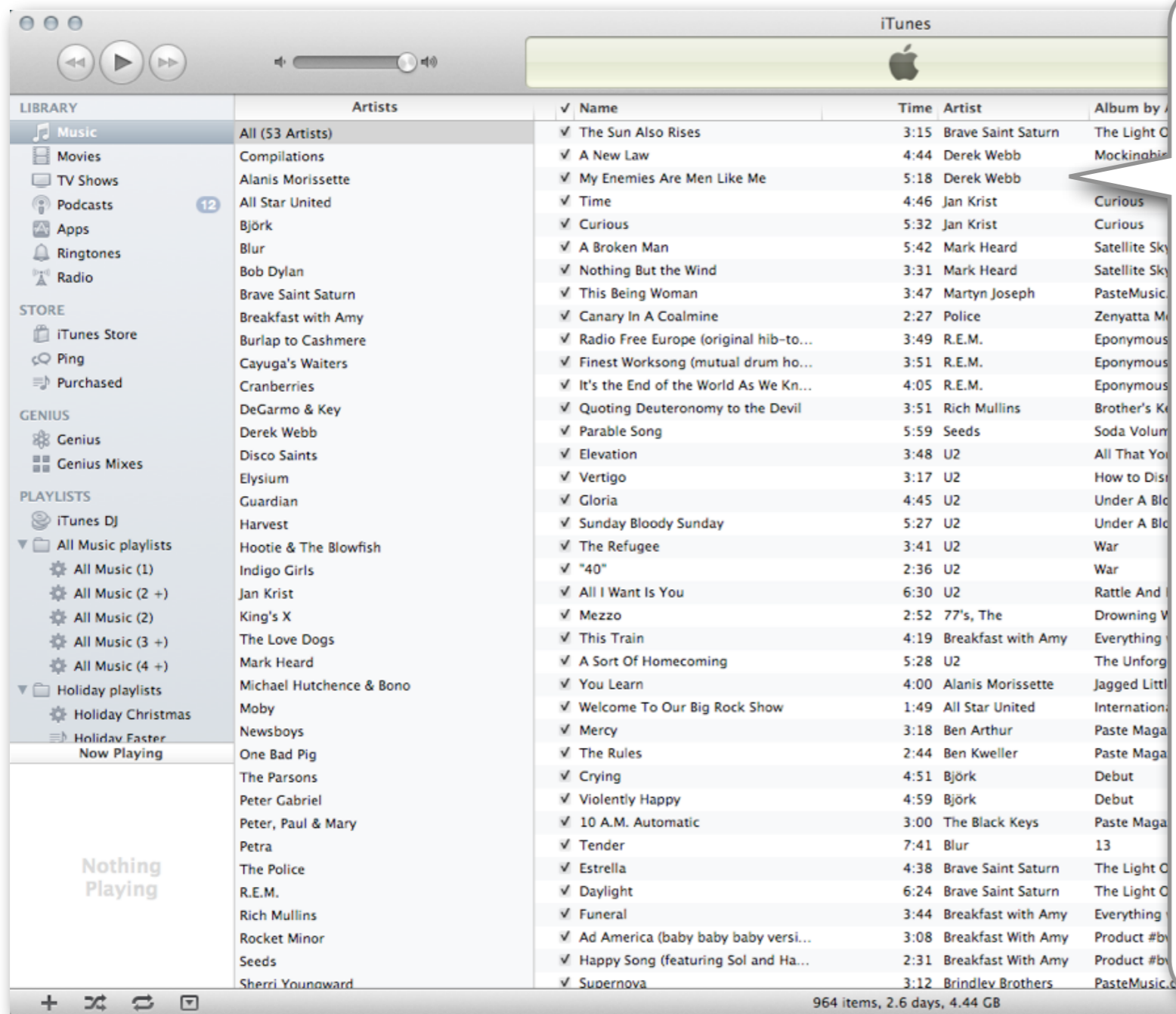


What are the visions?

- **Consumer**
 - Don't think about the cloud
- **Services**
 - Always available apps
- **Infrastructure**
 - Build with our tech services
- **Virtual Machines**
 - Rent a cloud computer



Consumer vision : iTunes Match



Your music, movies, television are always there on every Apple device.

Consumers don't know how it gets there.

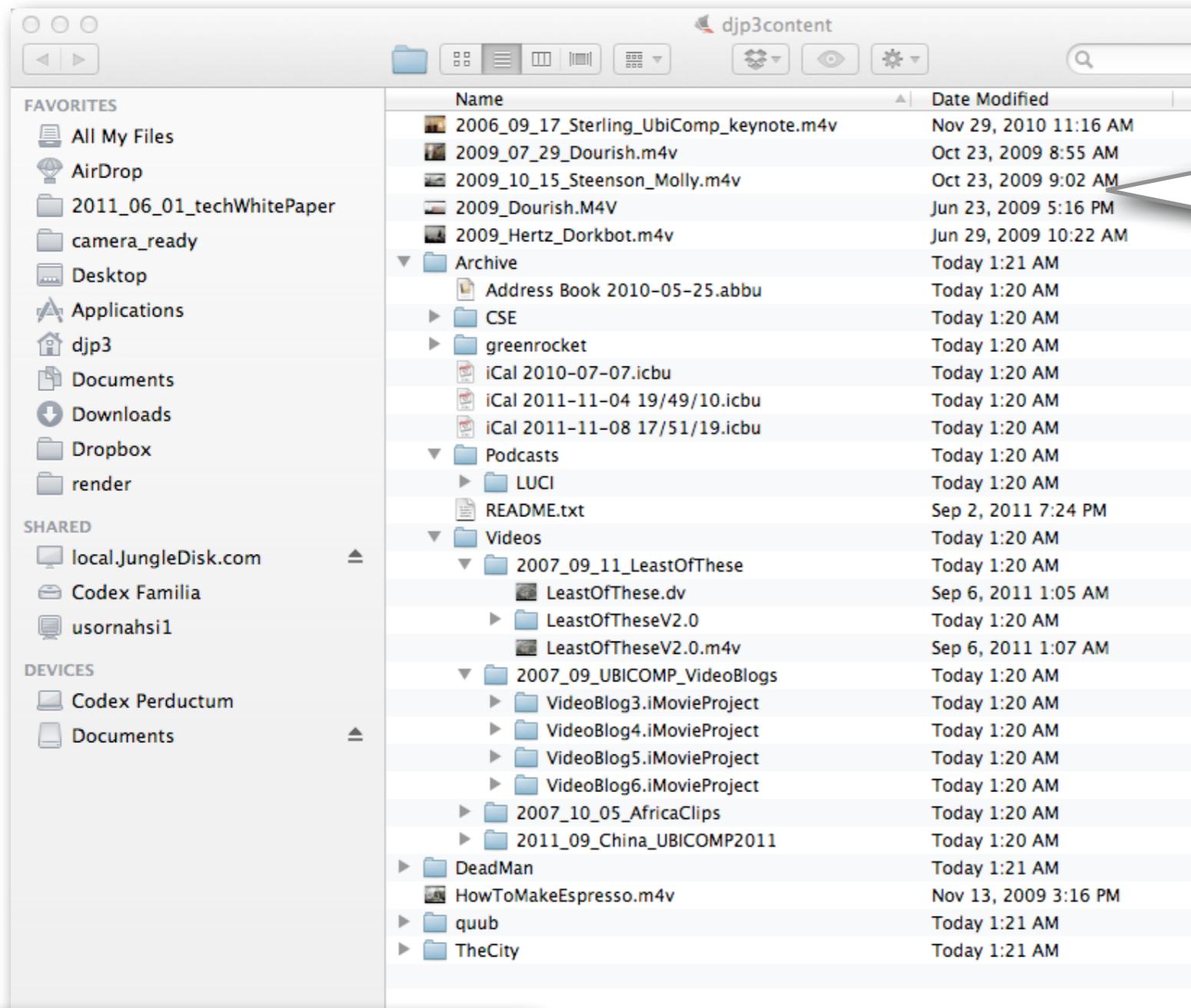
(It is all backed by an Apple data center)

And now that it is in the cloud there is no more syncing, no more worrying about disk space, no more worrying about back ups.

\$25.00 a year



Consumer vision : JungleDisk



An infinitely large hard-drive that never crashes

Consumers don't know where the data is kept.

(It is all backed by an Amazon data center)

Any data that you need is available on demand. Caching supports fast access

\$0.14 GB/month + txfr



What are the visions?

- Consumer
 - Don't think about the cloud
- Services
 - Always available apps
- Infrastructure
 - Build with our tech services
 - Virtual Machines
 - Rent a cloud computer



Services vision : Google Apps

The screenshot shows the Google Apps Admin Console interface. At the top, there are browser tabs for Amazon Simple Storage Service, Jungle Disk, and Donald J. Patterson III Mail. The main header includes the Google Apps logo, the domain name 'dj_p_3@djp3.net', and navigation links for 'Inbox', 'Calendar', 'Help', and 'Sign out'. A navigation menu contains 'Dashboard', 'Organization & users', 'Groups', 'Domain settings', 'Reports', 'Advanced tools', 'Setup', 'Support', 'Settings', and 'Help'. The main content area features several sections: a yellow banner for 'Add Chromebooks to your Google Apps domain', a blue box for 'Donald J. Patterson III' showing account information and a 'Seven-day active users' graph with values 0, 0, 1. Below this is a 'Service settings' section with a 'Google Apps Marketplace' link. The 'Core Google Apps suite' section lists various services with their respective URLs: Email, Calendar, Google Wave Labs, Video, Mobile, Docs, Sites, Chat, Postini Services, and Start Page. A tip at the bottom suggests connecting with other admins in the Google Apps admin community. The footer contains links for 'Terms of Service', 'Privacy policy', 'Suggest a feature', and 'Google Home', along with the copyright notice '©2011 Google Inc.'

A suite of collaborative business apps including email, calendar, word processing, spreadsheet, "powerpoint", chat

No limit on storage, no ads, no software updating, no security management, no downtime

(It is all backed by Google's data center)

Always on, available from any browser

\$50.00 per user/per year

Services vision : Quicken Online

Quicken ONLINE
Welcome be121307 My Profile Sign Out

Home My Accounts Track Spending

Visit December 20, 2007 3:28 PM PST

My Finances

Show Custom range

My Accounts

+ Add Edit Delete

Bank Accounts

Customer Central Bank

- My Checking \$257.14
- My Savings \$100,000.00

Total \$100,257.14

Credit Cards

Customer Central Bank

- Credit Card -\$2,436.50

Total -\$2,436.50

Total Balance \$97,820.64

Am I living within my means?

Have a question about these totals?

+ Money In
Nov 20 - Dec 20
\$108.99

- Money Out
Nov 20 - Dec 20
\$354.80

Manage bill reminders (for all accounts and dates)

Stop Reminders for this Payee Mark as Paid Send to Email/Phone

Next Due Date	Frequency	Payee	Next Payment
12-07-2007	Monthly	ING Direct	11.00
12-07-2007	Monthly	Nameste plaza fremont, S	11.00
12-08-2007	Monthly	Bharat Bajar Fremont, Sta	11.00
12-08-2007	Monthly	Comcast	11.00
12-08-2007	Monthly	Morgan Keegan	11.00

Not sure where to start?

Manage your money and finances online. Quicken connects to banks for you.

No backups, no hacker break-ins.

(It is all backed by ?'s data center)

Always on, available from any browser

\$2.99/per year

What are the visions?

- **Consumer**
 - Don't think about the cloud
- **Services**
 - Always available apps
- **Infrastructure**
 - Build with our tech services
 - Virtual Machines
 - Rent a cloud computer



Infrastructure: Amazon web services

The screenshot shows the AWS Management Console for the Amazon EC2 service in the US East (Virginia) region. The main content area is titled "Amazon EC2 Console Dashboard" and includes the following sections:

- Getting Started:** A yellow box with the text "To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance." and a prominent "Launch Instance" button. A note below states: "Note: Your instances will launch in the US East (Virginia) region."
- Service Health:** A table showing the current status of the Amazon EC2 service in the US East - N. Virginia region, which is "operating normally".
- Availability Zone Status:** A table showing the status of four availability zones (us-east-1a, us-east-1b, us-east-1c, us-east-1d), all of which are "operating normally".
- My Resources:** A summary of resources currently in use, including 0 Running Instances, 0 Elastic IPs, 0 EBS Volumes, 0 EBS Snapshots, 1 Key Pair, 2 Security Groups, 0 Load Balancers, and 0 Placement Groups.
- Related Links:** A list of links for documentation, all EC2 resources, forums, feedback, and reporting an issue.

A callout box on the right side of the dashboard contains the following text:

Create a computer in 2 minutes
Use it for as long as you want,
then shut it down.

\$0.085 per hour
(\$744 per year)

© 2008 - 2011, Amazon Web Services LLC or its affiliates. All rights reserved. | [Feedback](#) | [Support](#) | [Privacy](#)

Infrastructure: Amazon web services

AWS Management Console - Amazon EC2

Region: US East (Virginia)

EC2 Dashboard

- INSTANCES
 - Instances
 - Spot Requests
 - Reserved Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORAGE
 - Volumes
 - Snapshots
- NETWORK & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Load Balancers
 - Key Pairs

My Resources

You are using the following Amazon EC2 resources in the US East (Virginia) region:

- 0 Running Instances
- 0 Elastic IPs
- 0 EBS Volumes
- 0 EBS Snapshots
- 1 Key Pair
- 2 Security Groups
- 0 Load Balancers
- 0 Placement Groups

Related Links

- Documentation
- All EC2 Resources
- Forums
- Feedback
- Report an Issue

Availability Zone Status

Current Status	Details
✔ us-east-1a	Availability zone is operating normally
✔ us-east-1b	Availability zone is operating normally
✔ us-east-1c	Availability zone is operating normally
✔ us-east-1d	Availability zone is operating normally

© 2008 - 2011, Amazon Web Services LLC or its affiliates. All rights reserved. | [Feedback](#) | [Support](#) | [Privacy Policy](#) | [Terms of Use](#) | An [amazon.com](#) company

Create an auto-scaling Tomcat environment in 2 minutes

“easy to begin, impossible to outgrow”

\$35.27/month for basic usage

Infrastructure: Amazon web services

The screenshot shows the AWS Management Console interface for Amazon EC2. The main content area displays the 'Getting Started' section with a 'Launch Instance' button. A callout box is overlaid on the page, containing the text 'Create an infinitely large database instantly' and '\$0.11/hour'. The console also shows service health and availability zone status for the US East (Virginia) region.

Navigation

Region: US East (Virginia)

EC2 Dashboard

- INSTANCES
 - Instances
 - Spot Requests
 - Reserved Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes
 - Snapshots
- NETWORK & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Load Balancers
 - Key Pairs

Amazon EC2 Console Dashboard

Getting Started

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the US East (Virginia) region.

Service Health

Service Status

Current Status	Details
✔ Amazon EC2 (US East - N. Virginia)	Service is operating normally View complete service health details

Availability Zone Status

Current Status	Details
✔ us-east-1a	Availability zone is operating normally
✔ us-east-1b	Availability zone is operating normally
✔ us-east-1c	Availability zone is operating normally
✔ us-east-1d	Availability zone is operating normally

Related Links

- Documentation
- All EC2 Resources
- Forums
- Feedback
- Report an Issue

© 2008 - 2011, Amazon Web Services LLC or its affiliates. All rights reserved. | [Feedback](#) | [Support](#) | [Privacy Policy](#) | [Terms of Use](#) | An [amazon.com](#) company

Infrastructure: Amazon web services

The screenshot displays the AWS Management Console interface for the Amazon EC2 service. The browser address bar shows the URL `https://console.aws.amazon.com/ec2/home?region=us-east-1`. The console header includes the user name 'Donald J. Patterson' and a 'Help' link. The navigation pane on the left lists various AWS services, with 'Amazon EC2' selected. The main content area shows the 'Amazon EC2 Console Dashboard' with a 'Getting Started' section, a 'Service Health' section, and an 'Availability Zone Status' section. A callout box is overlaid on the dashboard, containing the text 'Create a data-flow process to compute on massive data sets' and '\$0.015/hour'.

Navigation

Region: US East (Virginia)

EC2 Dashboard

- INSTANCES
 - Instances
 - Spot Requests
 - Reserved Instances
- IMAGES
 - AMIs
 - Bundle Tasks
- ELASTIC BLOCK STORE
 - Volumes
 - Snapshots
- NETWORK & SECURITY
 - Security Groups
 - Elastic IPs
 - Placement Groups
 - Load Balancers
 - Key Pairs

Amazon EC2 Console Dashboard

Getting Started

To start using Amazon EC2 you will need to launch an Amazon EC2 instance.

[Launch](#)

Note: Your instances will launch in the selected region.

Service Health

Service Status

Current Status	Details
✔ Amazon EC2 (US East - N. Virginia)	Service is operating normally View complete service health details

Availability Zone Status

Current Status	Details
✔ us-east-1a	Availability zone is operating normally
✔ us-east-1b	Availability zone is operating normally
✔ us-east-1c	Availability zone is operating normally
✔ us-east-1d	Availability zone is operating normally

EC2 resources in the US East [Refresh](#)

- 0 Elastic IPs
- 0 EBS Snapshots
- 2 Security Groups
- 0 Load Balancers
- 0 Placement Groups

Related Links

- > Documentation
- > All EC2 Resources
- > Forums
- > Feedback
- > Report an Issue

© 2008 - 2011, Amazon Web Services LLC or its affiliates. All rights reserved. | [Feedback](#) | [Support](#) | [Privacy Policy](#) | [Terms of Use](#) | An [amazon.com](#) company

Infrastructure: Heroku platform services

Heroku | How it Works

Heroku | How it Works

How it Works | Pricing | Add-ons | Dev Center | Support | Contact | Login

Build | Operate

Deploy | Connect | Command | Observe | Scale

Control Surface APIs

Dyno Manifold

Logplex

Routing Dynos

Application Dynos

How it Works

Take a tour of the most productive, powerful, and scalable cloud application platform, and learn how Heroku structures and handles your app, deploys, scaling, and traffic.

Click around the diagram or the tabs above to explore.

Heroku

Business

Platform

Resources

About

Contact

Jobs

Legal

Privacy Policy

Why Heroku

Success Stories

Partner Program

News & Events

Blog

How It Works

Pricing

Add-ons

Documentation

Support

Status

Create web applications with separation of concerns on demand (app/database/asset servers)

Optimized for release engineering

Integrates with source code repositories so you can continuously deploy

price scales with demand

What are the visions?

- **Consumer**
 - Don't think about the cloud
- **Services**
 - Always available apps
- **Infrastructure**
 - Build with our tech services
 - Virtual Machines
 - Rent a cloud computer



Virtual Machines: Slicehost

The screenshot shows the SliceManager interface for a user named djp3@quub.com. The main content is a table of virtual machines (slices) with the following data:

Slice	Status	RAM	IP	Bandwidth	Backups	Age
communications.quub.com ID: 31006	active	512 MB	173.45.242.178	0.69GB of 300GB ¹ 0.26 in / 0.43 out	On	over 2 years
dev.quub.com ID: 31009	active	1536 MB	173.45.242.181	2.00GB of 900GB ¹ 1.21 in / 0.80 out	On	
vpn.quub.com ID: 56376	active	256 MB	173.45.226.152	6.95GB of 150GB ¹ 3.53 in / 3.42 out	Off	
swayr-stage ID: 20292436	active	2048 MB	173.45.226.56	0.17GB of 1200GB ¹ 0.09 in / 0.09 out	Off	
swayr-production ID: 20304506	active	2048 MB	173.45.226.172	0.07GB of 1200GB ¹ 0.03 in / 0.04 out	Off	

¹ Bandwidth included in the Slice plan
We **pool bandwidth** across Slices: Available: 3750GB, Used: 9.89GB
Bandwidth is reset at the end of your bill cycle. Your next bill date is 2011-11-24

Rent a computer on demand

Clone an existing computer

Customer does all the admin

\$40.00 / month

Yesterday's Tomorrows

Pers Ubiquit Comput (2006)
DOI 10.1007/s00779-006-0071-x

ORIGINAL ARTICLE

Genevieve Bell · Paul Dourish

Yesterday's tomorrows: notes on ubiquitous computing's dominant vision

Received: 31 August 2005 / Accepted: 25 April 2006
© Springer-Verlag London Limited 2006

Abstract Ubiquitous computing is unusual amongst technological research arenas. Most areas of computer science research, such as programming language implementation, distributed operating system design, or denotational semantics, are defined largely by technical problems, and driven by building upon and elaborating a body of past results. Ubiquitous computing, by contrast, encompasses a wide range of disparate technological areas brought together by a focus upon a common vision. It is driven, then, not so much by the problems of the past but by the possibilities of the future. Ubiquitous computing's vision, however, is over a decade old at this point, and we now inhabit the future imagined by its pioneers. The future, though, may not have worked out as the field collectively imagined. In this article, we explore the vision that has driven the ubiquitous computing research agenda and the contemporary practice that has emerged. Drawing on cross-cultural investigations of technology adoption, we argue for developing a "ubicom of the present" which takes the messiness of everyday life as a central theme.

1 Introduction

Ubiquitous computing (ubicom) research is characterized primarily by a concern with potential future computational worlds. This notion of research by future envisionment has been a feature of ubicom discourse and reasoning since its earliest days; Weiser [1] foundational article is even entitled "The Computer for the twenty-first Century"—an explicit look towards a pos-

sible future. Rhetorically, Weiser situates the research activities that he describes there as initial steps upon a path of technological development inspired by an explicit vision of possible future relationships between people, practice, and technology. Although much of his article describes a research program already under way and some of the early results that it had produced, the dominant theme of the article is the twin challenge of anticipating future trends and meeting future needs.

Weiser's article was doubly influential. Not only did it articulate a research agenda that many have embraced, it also set a rhetorical tone that many have adopted. So, the same concern with technological futures continues to feature in the ways in which ubicom research agendas are framed and in which technological advances are motivated and measured. Ubiomp is essentially defined by its visions of a technological future. Often, this is taken directly from Weiser's own work; almost one quarter of all the papers published in the Ubicom conference between 2001 and 2005 cite Weiser's foundational articles, a remarkable number of publications to cite a single vision as fundamental for their own work over a decade later. Even in cases where Weiser's own vision is not a driving factor, the idea that ubiquitous computing research is exploring prototypes of tomorrow's everyday technology and everyday experience is a pervasive one.

Such visions, however, are interesting not just for what they say about the future but also for what they say about the present. This seems to be particularly the case when it comes to normative social relationships. Envisionments of the future, such as those of the Worlds Fairs [2], Disney's Tomorrowland [3], or most popular science fiction [4] have provided a useful analytic focus for considering how the problems of today are perceived, framed, and understood. In this paper, we are concerned with the balance between past, present, and future embedded in conventional discourses about ubiquitous computing. In particular, we are interested in the central conundrum posed by the fact that Weiser's vision of the future is, by this point, not only an old one,

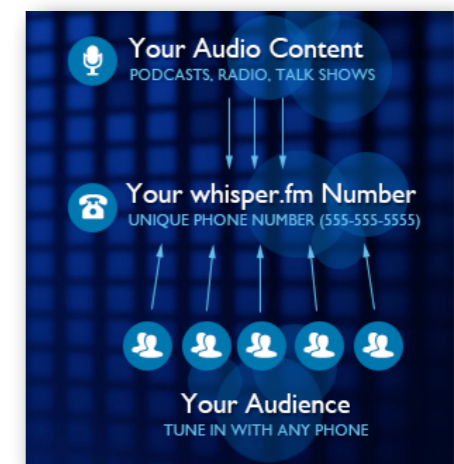
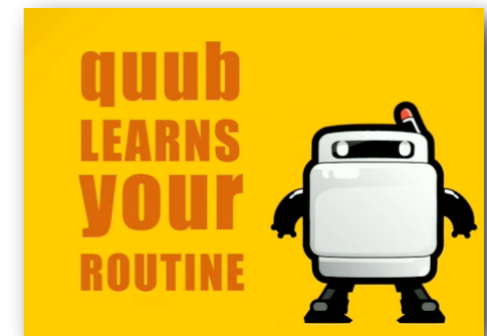
G. Bell (✉)
Intel Corporation, Santa Clara, CA, USA
E-mail: genevieve.bell@intel.com

P. Dourish
University of California, Irvine, CA, USA
E-mail: jpd@ics.uci.edu

- The rhetoric is clean, the reality is messy
- If we aren't careful we'll miss the progress
- Many places in the world have a different experience of computing

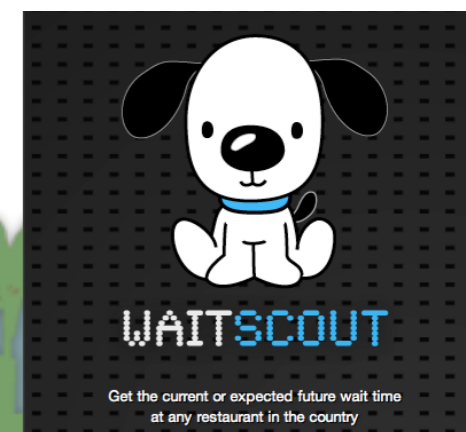
What is my experience?

- <http://www.quub.com>
- <http://whisper.fm>
- <http://swayr.com>
- <http://waitscout.com>



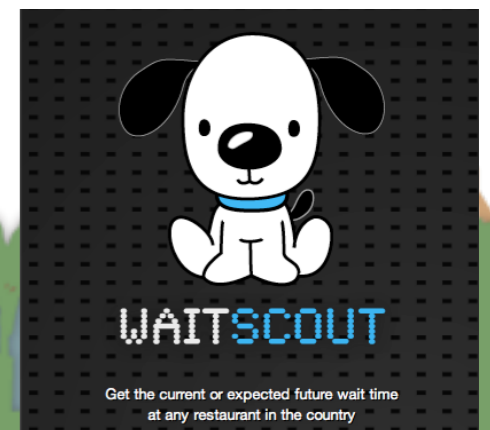
What is my experience?

- Robustness is hard
 - Ambulance
 - Latency works against you
- Dealing with venture capitalists is rough
 - selling the future (bump)
 - “build a great company”
- Challenges of working in China
 - microblog monitoring
 - copied the product
 - car logger



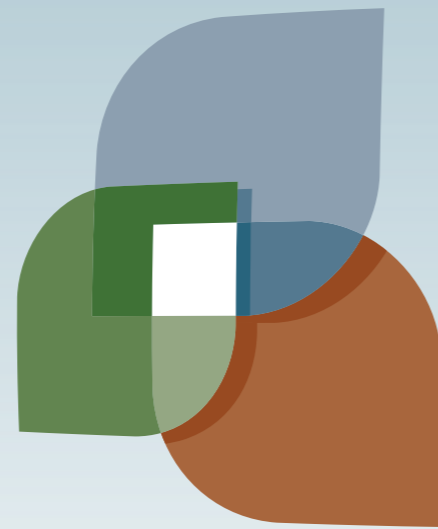
What is my experience?

- “this is too futuristic for us”
- Other thoughts
 - geographical domain and legislation hasn't caught up yet with cloud abstractions
 - It's not actually a cloud - it consumes resources
 - The movie Avatar create 1 petabyte of data



Poll





L U C I

