

# UbiComp In The Clouds: Observations, Reflections and Experiences

Donald J. Patterson

Donald Bren School of Information and Computer Sciences  
Department of Informatics  
Laboratory for Ubiquitous Computing and Interaction

INF 241

01/10/2012



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<http://www.ics.uci.edu/~djp3>

# : My Background

- B.S., Computer Science from Cornell (NY)
  - M.Eng, Electrical Engineering
- STRIKE Officer
  - USS CURTIS WILBUR, DDG-54, Japan
- Operations Officer
  - USS SIMON LAKE, AS-33, Italy
- Ph.D in Computer Science and Engineering at UW
- Director of the Laboratory for Ubiquitous Computing and Interaction
- Co-founder of quub, whisper.fm, swayr



Cornell University  
Naval ROTC



# : What is Ubiquitous Computing?



## : What is Ubiquitous Computing?

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

### 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

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# : The origins of Ubicomp as a academic discipline

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## The Computer for the 21st Century

*Specialized elements of hardware and software, connected by wires, radio waves and infrared, will be so ubiquitous that no one will notice their presence*

by Mark Weiser

The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.

Consider writing, perhaps the first information technology. The ability to represent spoken language symbolically for long-term storage freed information from the limits of individual memory. 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

is approachable only through complex jargon that has nothing to do with the tasks for which people use computers. The state of the art is perhaps analogous to the period when scribes had to know as much about making ink or baking clay as they did about writing.

The arcane aura that surrounds personal computers is not just a "user interface" problem. My colleagues and I 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.

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.

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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

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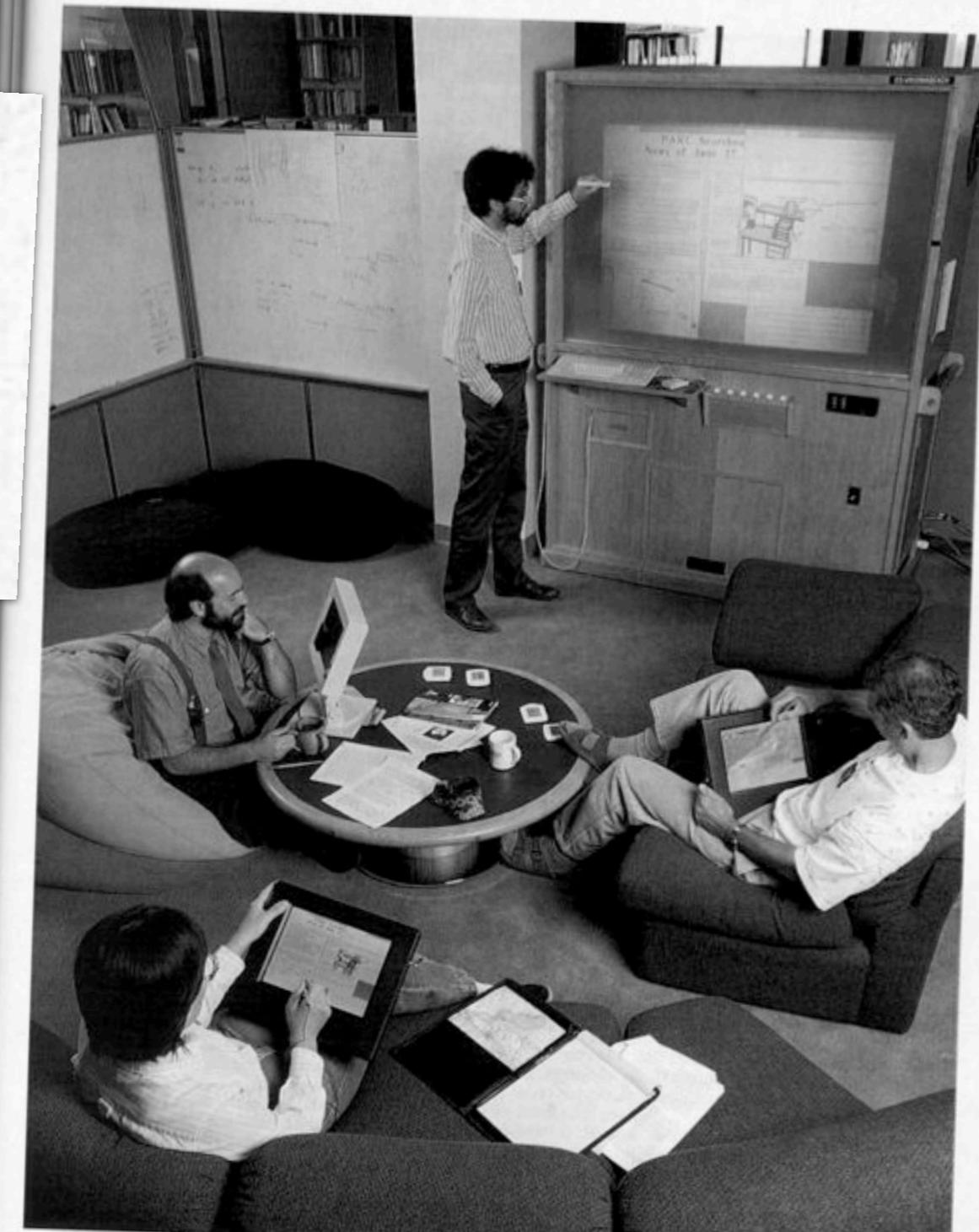
Such a disappearance is a fundamental consequence not of technology but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading. Computer 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 super laptop 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.

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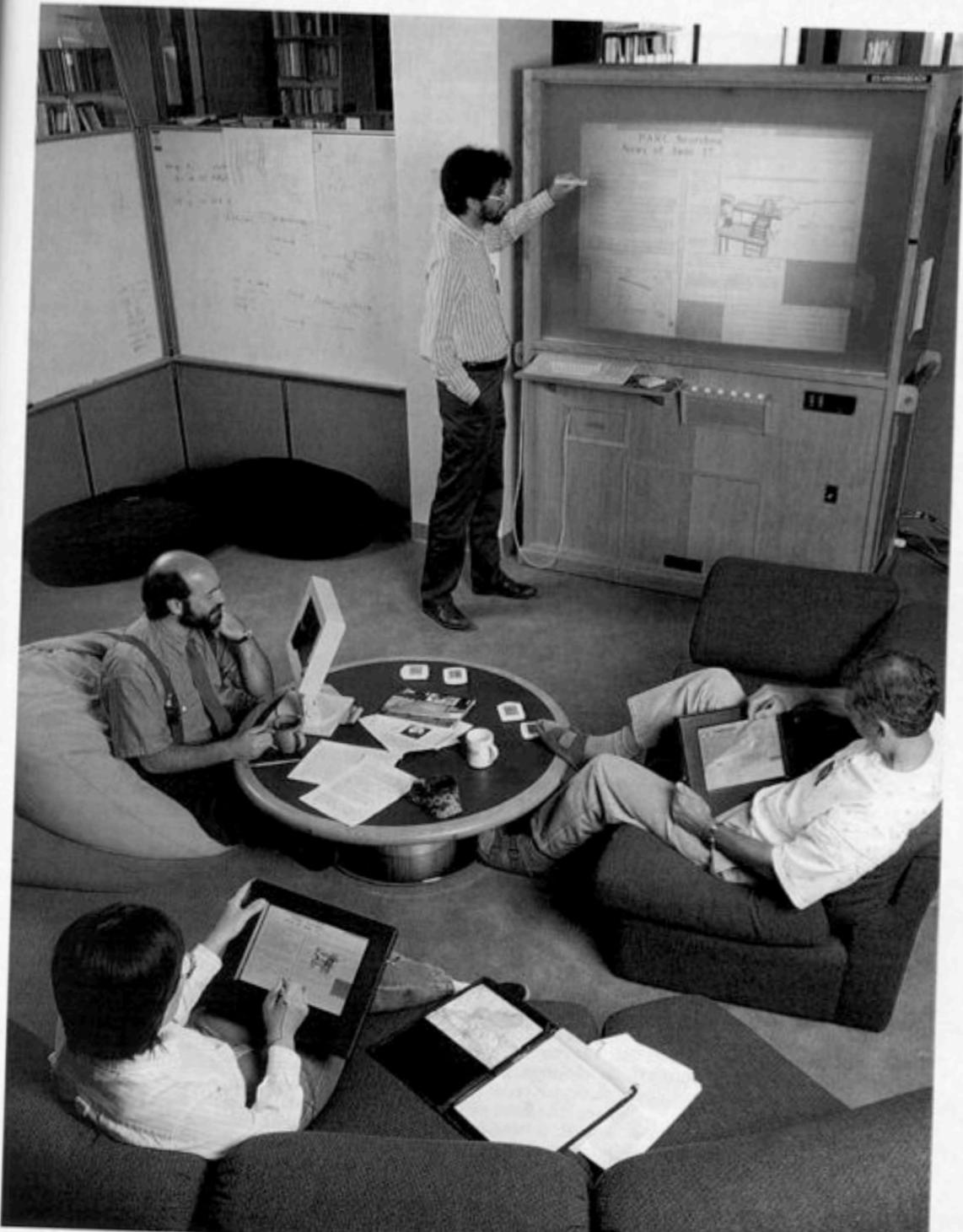
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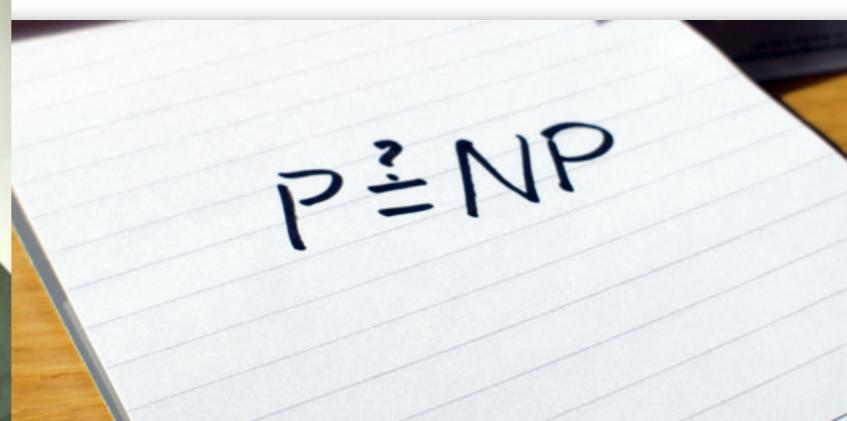
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## Zero Wave

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





## First Wave

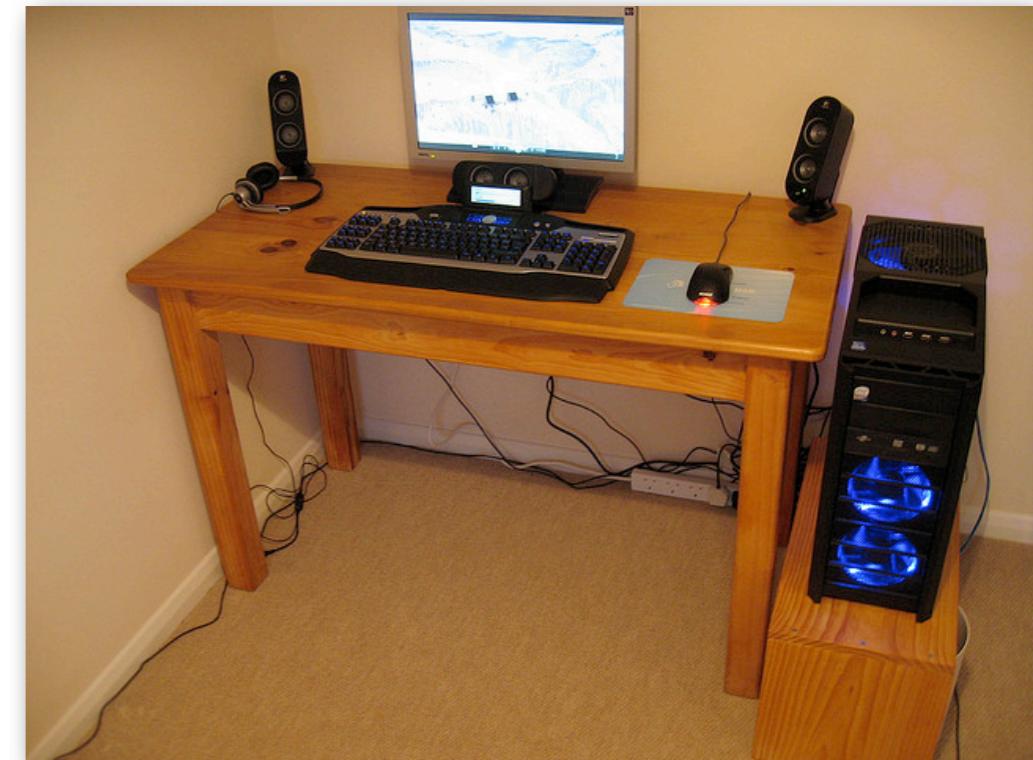
- Main Frame Computing
  - 1960-1970
  - Massive computers to do simple data processing
  - Few computers in the world





## 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





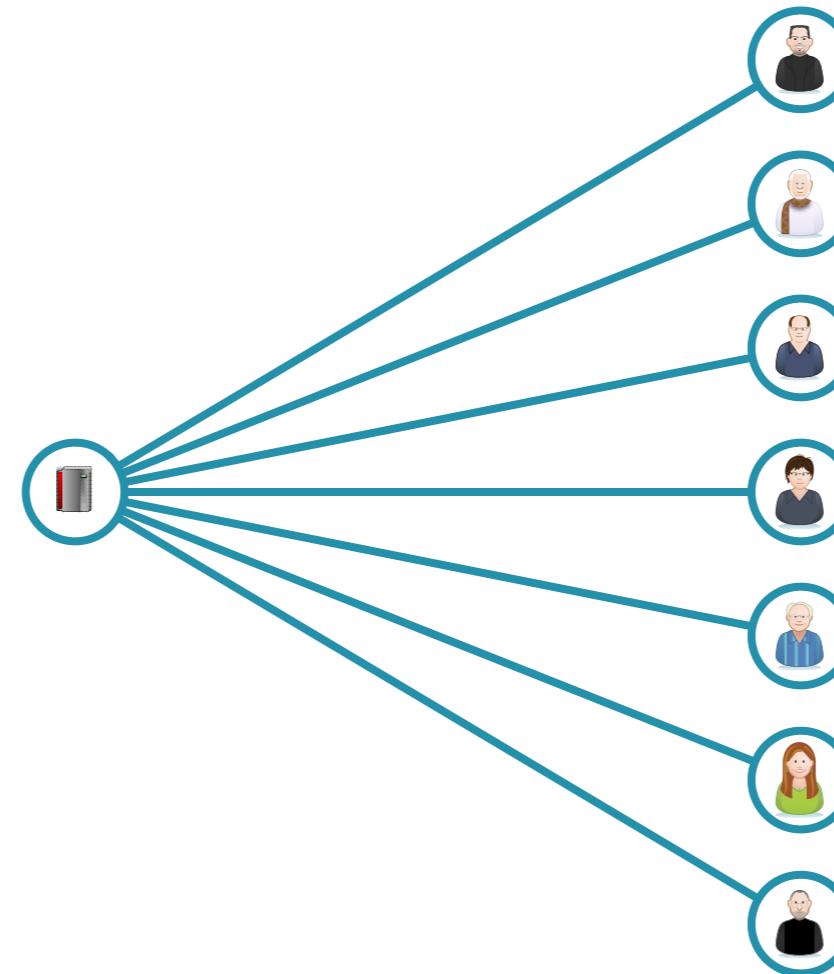
## Third Wave

- 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

## First Wave



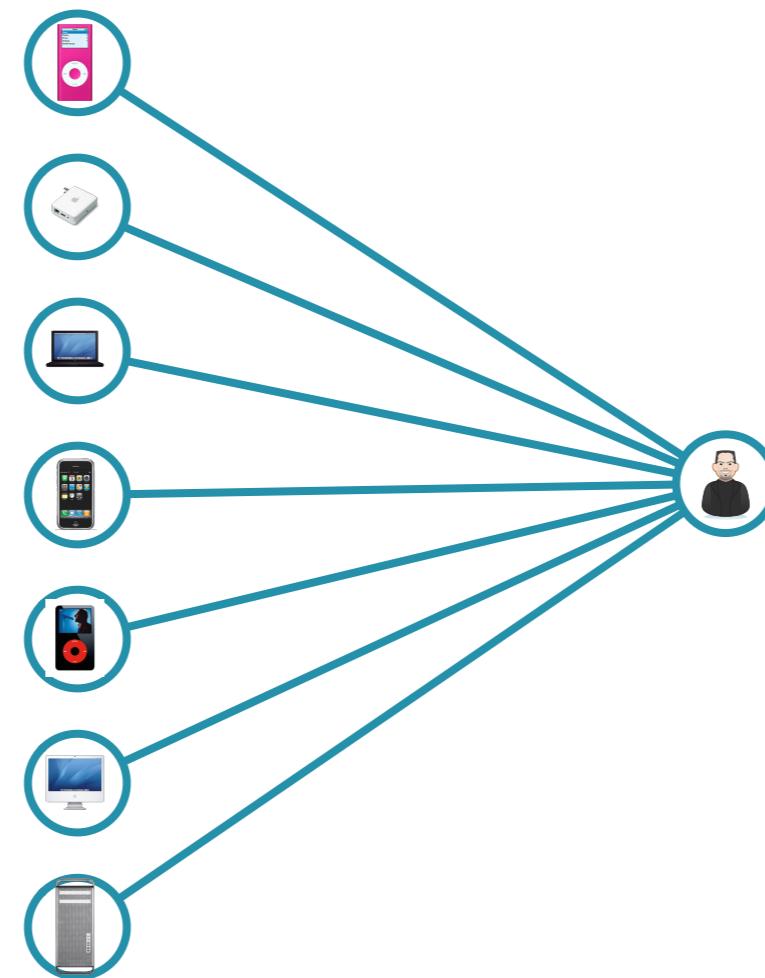
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## Second Wave



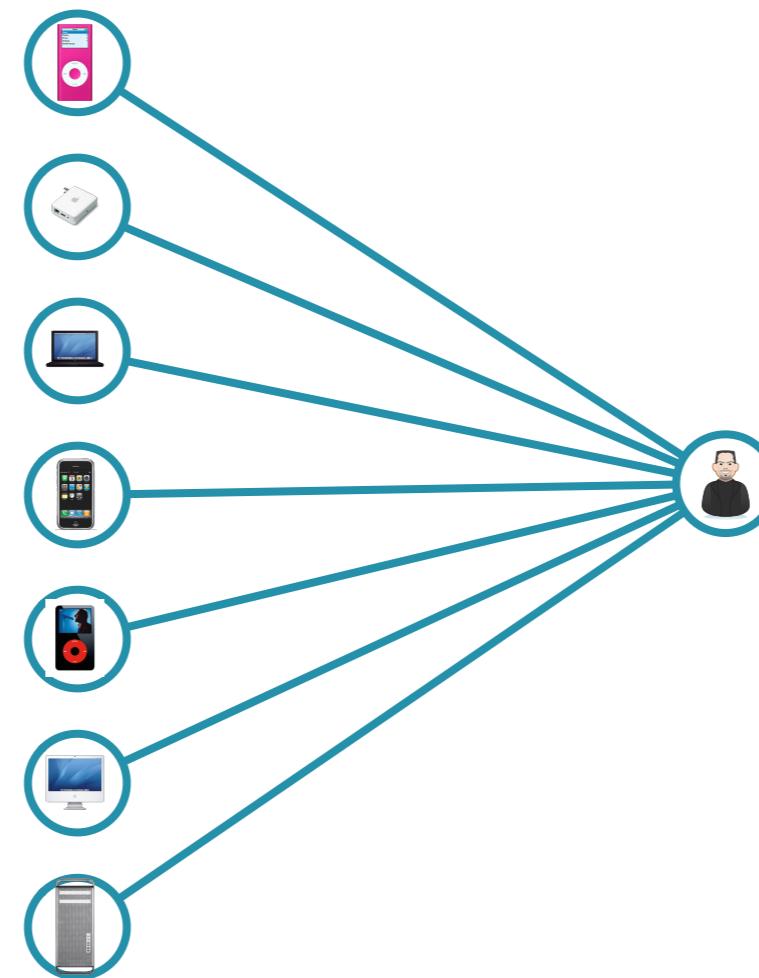
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## Third Wave



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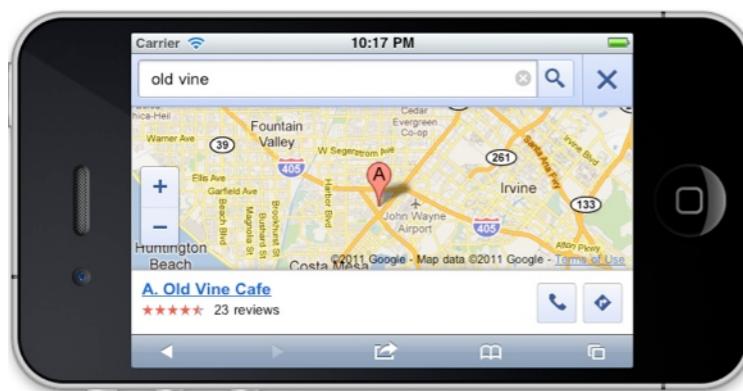
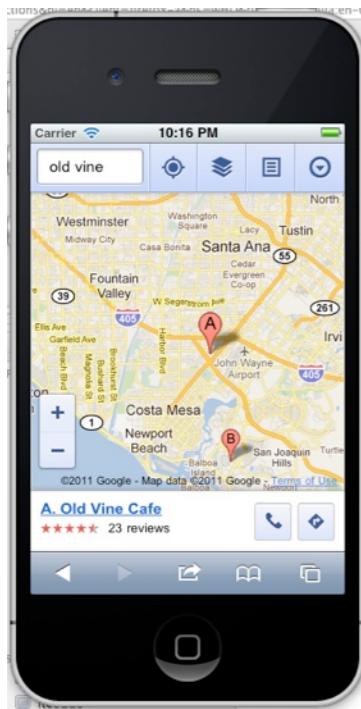
## Third Wave



How are we going to manage all of these devices?

: Ubicomp is about people's relationship to computers

Ubicomp — Augmented Reality — Virtual Reality

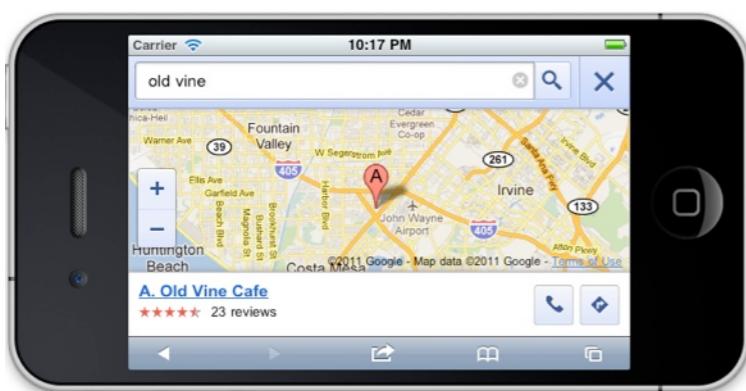
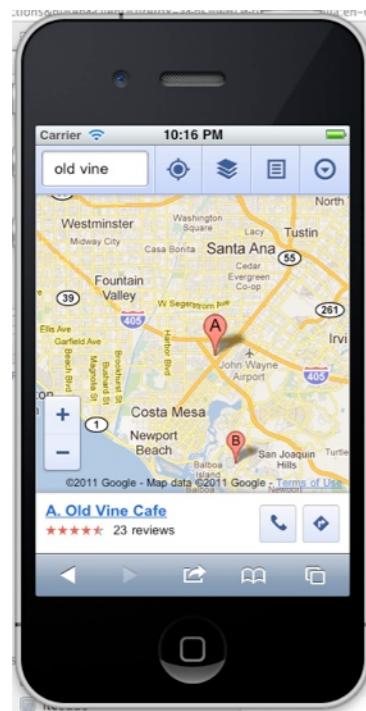


Virtual Worlds

Mirror Worlds

: Ubicomp is about people's relationship to computers

Ubicomp — Augmented Reality — Virtual Reality



ar photo, vr photo, green photo

# Ubicomp is about people's relationship to computers

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

Who is going to manage all of these devices?

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

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!

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}  
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# Why now? What has changed?

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

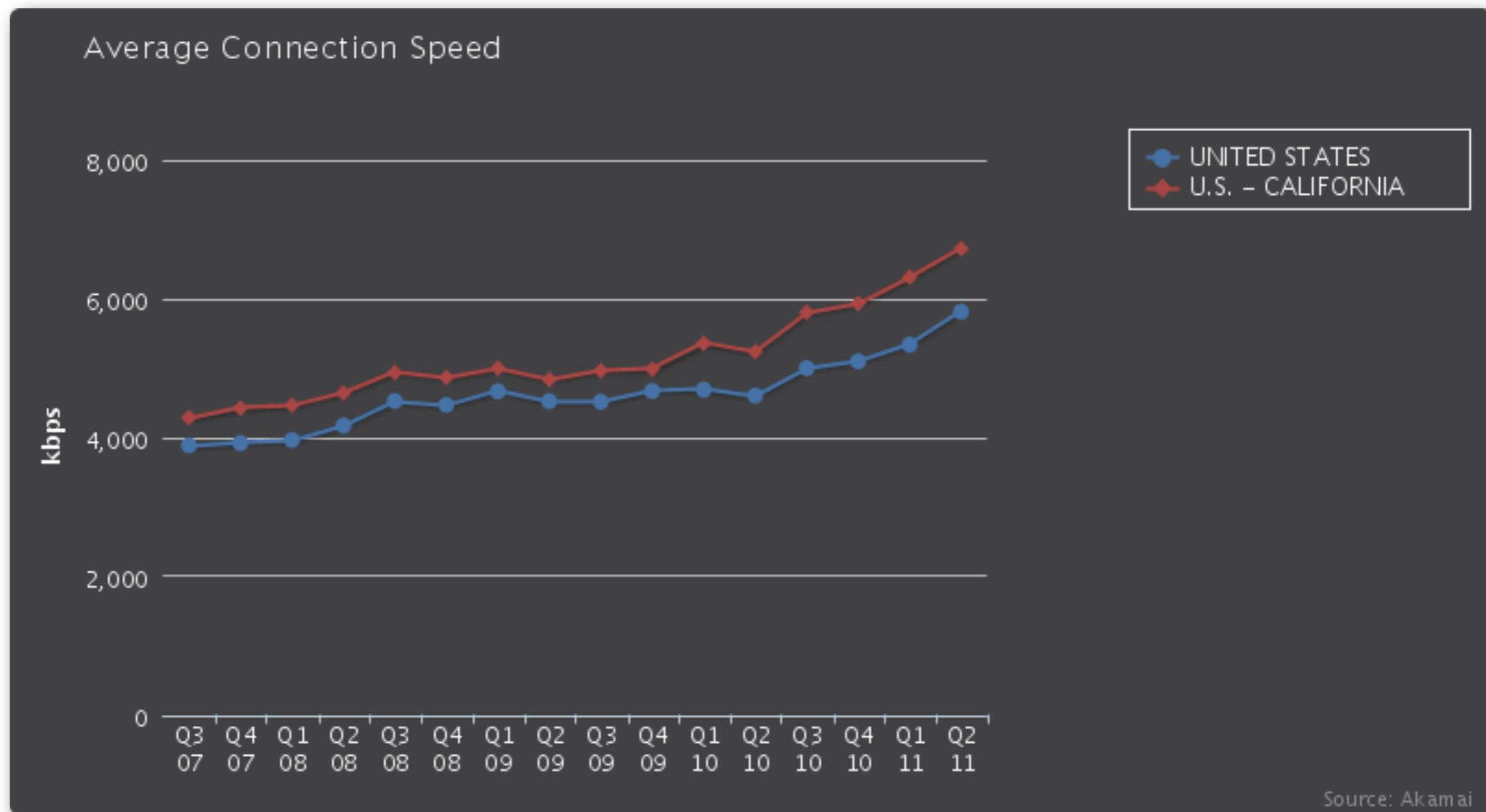


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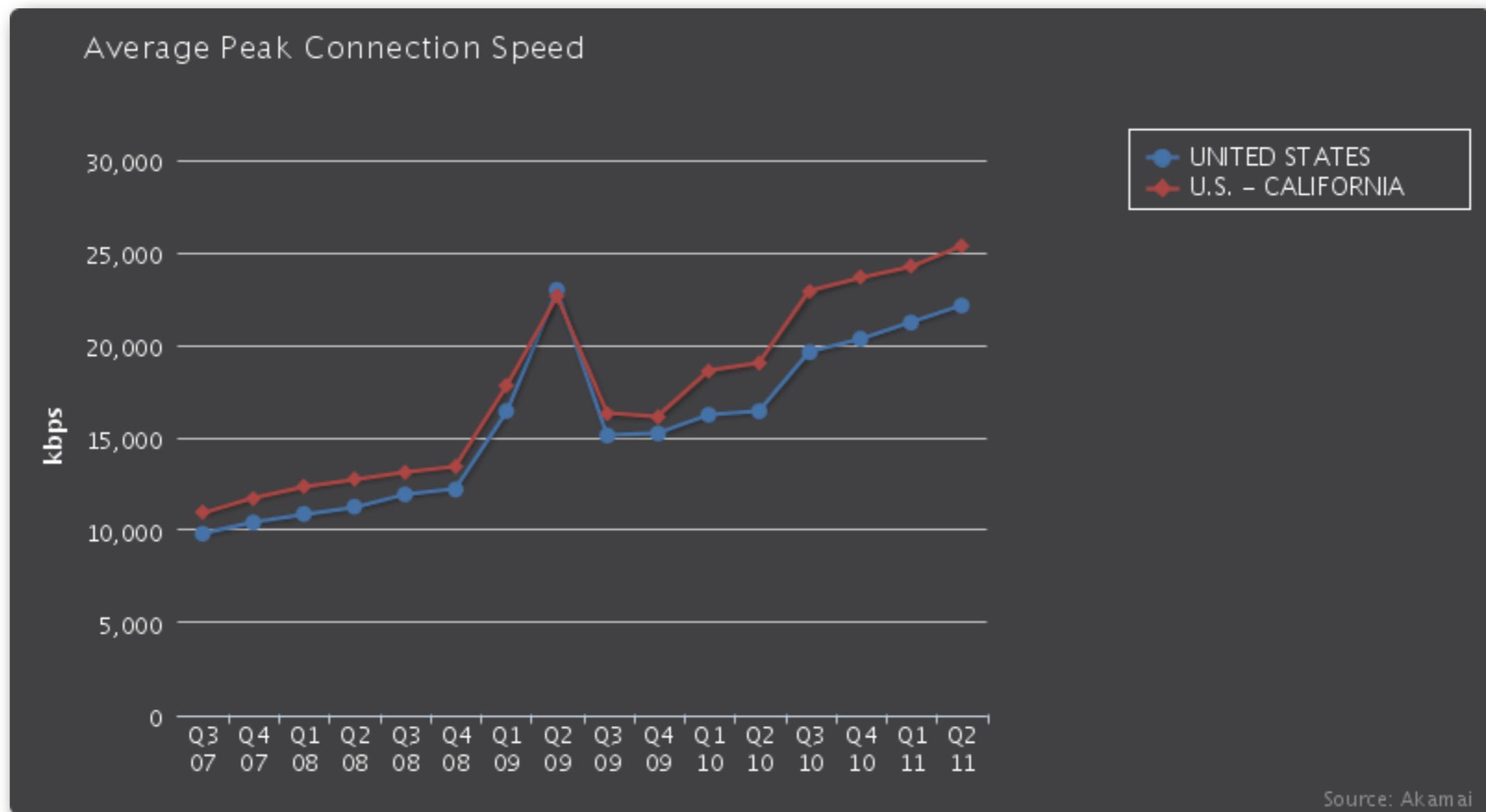
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# Connectivity



# Connectivity



Which country has the fastest mobile broadband?

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**Greece**  
(5.3 mbps average)

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**Austria**

(23.4 mbps highest average peak connection speed)

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

-akamai

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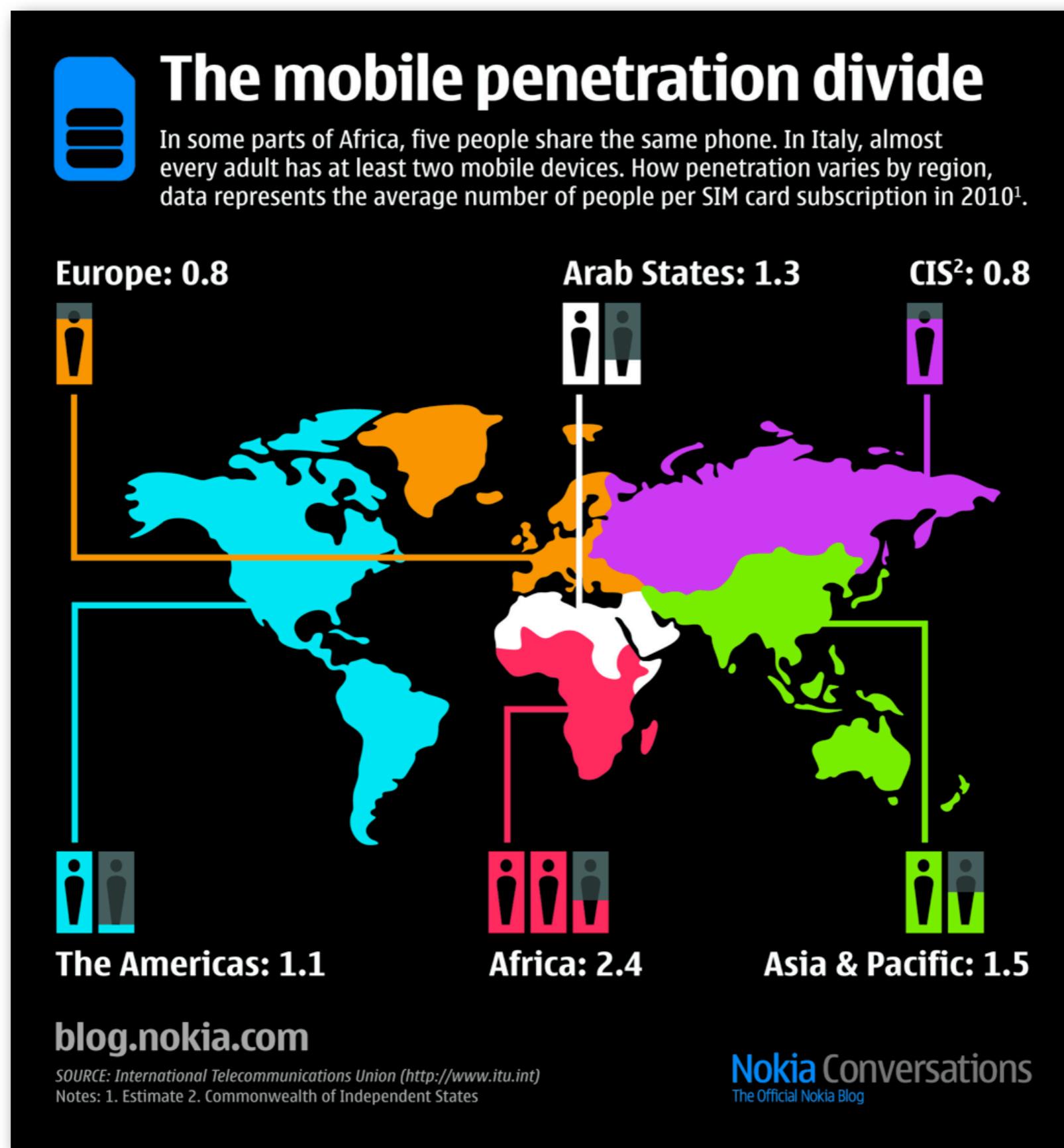
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## The mobile penetration divide

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, data represents the average number of people per SIM card subscription in 2010<sup>1</sup>.

Europe: 0.8



Arab States: 1.3



CIS<sup>2</sup>: 0.8

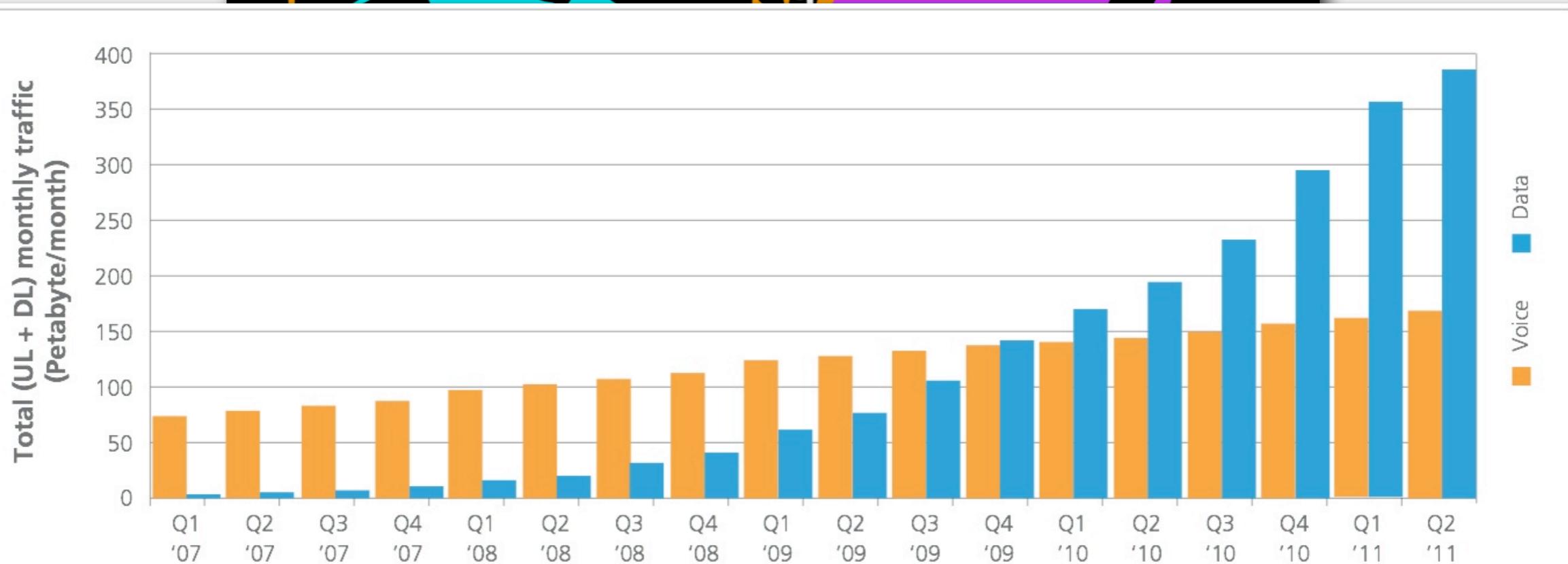


Figure 40: Total Monthly Mobile Voice and Data as Measured by Ericsson [Source: Ericsson]

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# Virtualization Technology



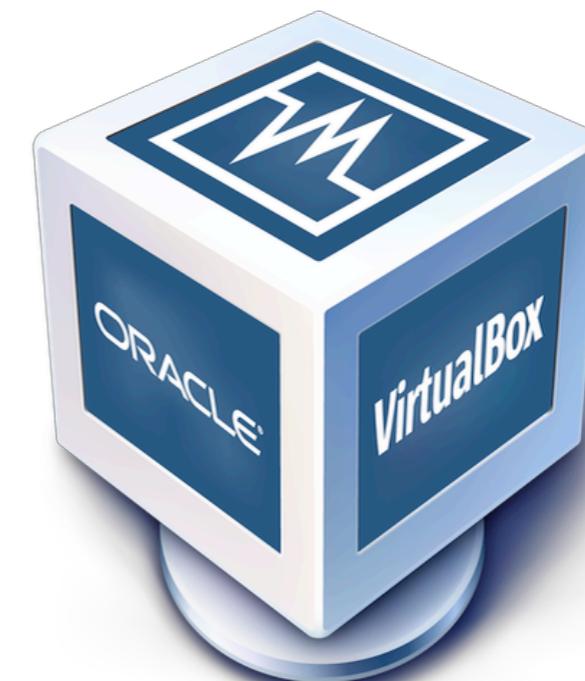
Windows 7 Running in a  
Virtual Machine on a Mac

# 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

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# Security Threats

# Security Threats





- 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

## China, U.S., Israel

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## Anonymous, LulzSec

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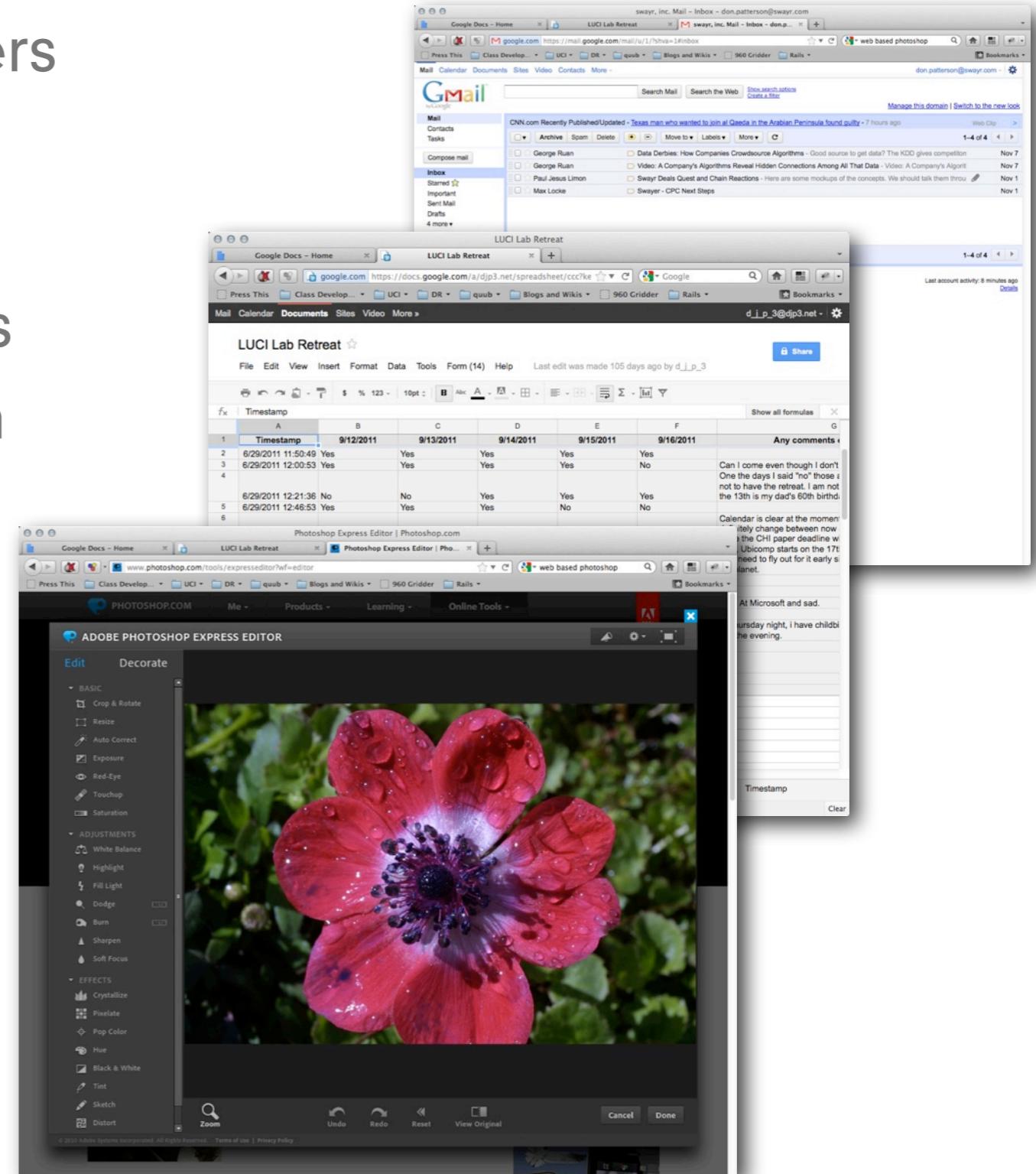
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# Sentient browser applications

- 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



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So, now the landscape has changed



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So, now the landscape has changed



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

So, now the landscape has changed



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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



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

So, now the landscape has changed



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

So, now the landscape has changed



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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



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# Consumer vision : iTunes Match

iTunes

LIBRARY

Music (53 Artists)

Movies

TV Shows

Podcasts (12)

Apps

Ringtones

Radio

STORE

iTunes Store

Ping

Purchased

GENIUS

Genius

Genius Mixes

PLAYLISTS

iTunes DJ

All Music playlists (1)

All Music (2 +)

All Music (2)

All Music (3 +)

All Music (4 +)

Holiday playlists

Holiday Christmas

Holiday Faster

Now Playing

Nothing Playing

Artists

✓ Name

Time Artist

Album by Artist

Genre

iTunes Sidebar

✓ The Sun Also Rises 3:15 Brave Saint Saturn The Light Of Things Hoped For... Rock

✓ A New Law 4:44 Derek Webb Mockingbird Rock

✓ My Enemies Are Men Like Me 5:18 Derek Webb Mockingbird Rock

✓ Time 4:46 Jan Krist Curious Folk-Rock

✓ Curious 5:32 Jan Krist Curious Folk-Rock

✓ A Broken Man 5:42 Mark Heard Satellite Sky Rock

✓ Nothing But the Wind 3:31 Mark Heard Satellite Sky Rock

✓ This Being Woman 3:47 Martyn Joseph PasteMusic.com Sampler IV Folk-Rock

✓ Canary In A Coalmine 2:27 Police Zenyatta Mondatta Rock

✓ Radio Free Europe (original hib-to...) 3:49 R.E.M. Eponymous Rock

✓ Finest Worksong (mutual drum ho...) 3:51 R.E.M. Eponymous Rock

✓ It's the End of the World As We Kn... 4:05 R.E.M. Eponymous Rock

✓ Quoting Deuteronomy to the Devil 3:51 Rich Mullins Brother's Keeper Folk-Rock

✓ Parable Song 5:59 Seeds Soda Volume 20 Folk-Rock

✓ Elevation 3:48 U2 All That You Can't Leave Behind Rock

✓ Vertigo 3:17 U2 How to Dismantle an Atomic Bomb Rock

✓ Gloria 4:45 U2 Under A Blood Red Sky Live Rock

✓ Sunday Bloody Sunday 5:27 U2 Under A Blood Red Sky Live Rock

✓ The Refugee 3:41 U2 War Rock

✓ "40" 2:36 U2 War Rock

✓ All I Want Is You 6:30 U2 Rattle And Hum Rock

✓ Mezzo 2:52 77's, The Drowning With Land In Sight Hard Rock

✓ This Train 4:19 Breakfast with Amy Everything was Beautiful and Nothing Hurt Hard Rock

✓ A Sort Of Homecoming 5:28 U2 The Unforgettable Fire Rock

✓ You Learn 4:00 Alanis Morissette Jagged Little Pill Rock

✓ Welcome To Our Big Rock Show 1:49 All Star United International Anthems For The Human Race Alternative

✓ Mercy 3:18 Ben Arthur Paste Magazine Sampler #9 Rock

✓ The Rules 2:44 Ben Kweller Paste Magazine Sampler #9 Rock

✓ Crying 4:51 Björk Debut Rock

✓ Violently Happy 4:59 Björk Debut Rock

✓ 10 A.M. Automatic 3:00 The Black Keys Paste Magazine Sampler #12 Rock

✓ Tender 7:41 Blur 13 Rock

✓ Estrella 4:38 Brave Saint Saturn The Light Of Things Hoped For... Rock

✓ Daylight 6:24 Brave Saint Saturn The Light Of Things Hoped For... Rock

✓ Funeral 3:44 Breakfast with Amy Everything was Beautiful and Nothing Hurt Hard Rock

✓ Ad America (baby baby baby versi...) 3:08 Breakfast With Amy Product #bvc3 3482 (love gift) Hard Rock

✓ Happy Song (featuring Sol and Ha... 2:31 Breakfast With Amy Product #bvc3 3482 (love gift) Hard Rock

✓ Supernova 3:12 Brindley Brothers PasteMusic.com Sampler IV Rock

Genius Recommended Albums

You have music by U2 The Rising Bruce Springsteen

You have music by Louis Armstrong Porgy and Bess Ella Fitzgerald & Louis ...

You have music by Petra The Champion Carman

You have music by Sammy Ward In the Making... Nevertheless

Genius Recommended Songs

You have music by Las Ketchup Maria (Pablo Flores Spangl... Ricky Martin

You have music by The Elders Roll the Woodpile Down The Dreadnoughts

You have music by Howie Day Careful Guster

You have music by Lost Dogs Why Don't You Look Into Je... Larry Norman

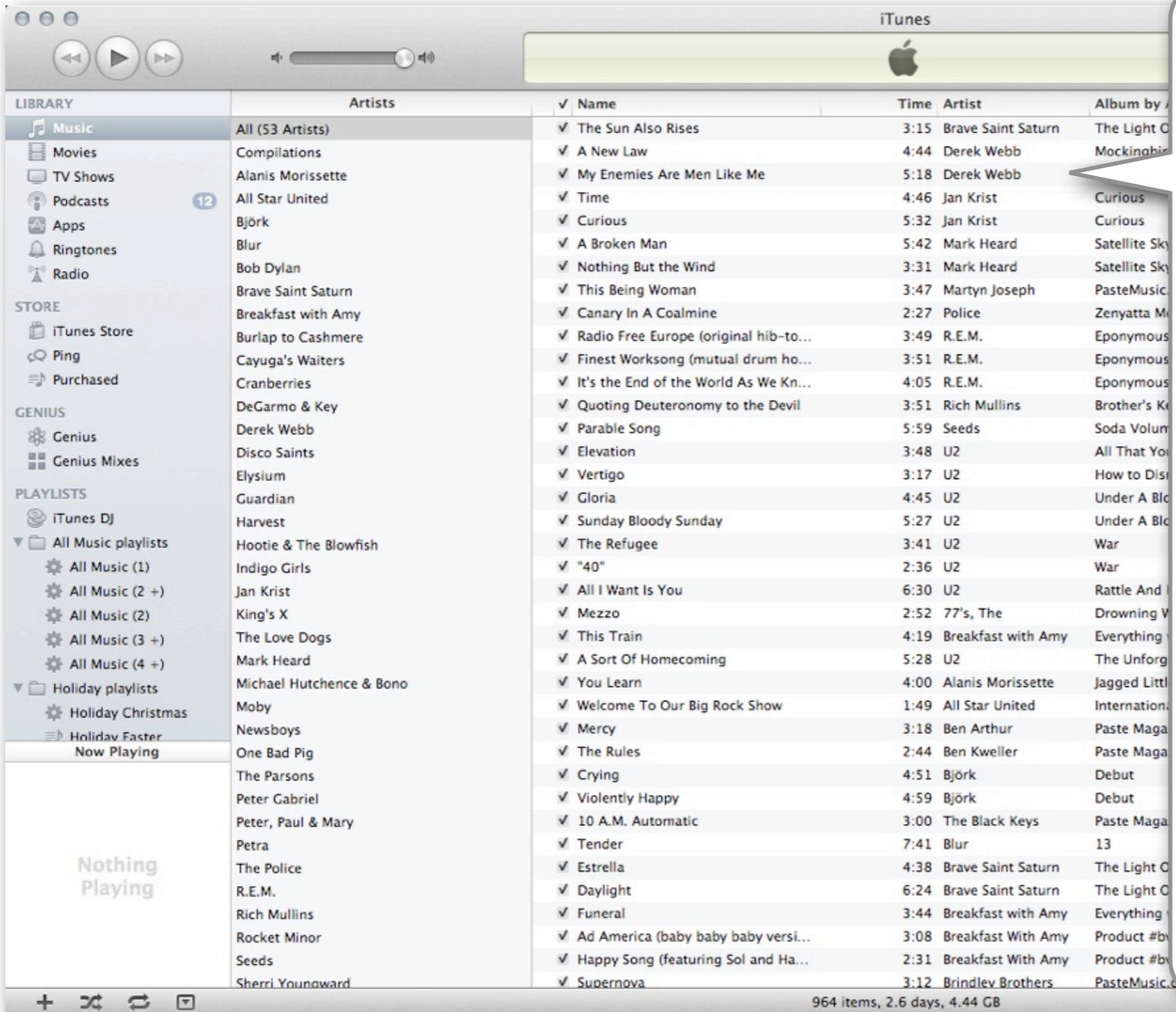
You have music by MuteMath Starts With One Shiny Toy Guns

You have music by Kenny Meeks Lois Lane Hamilton

964 items, 2.6 days, 4.44 GB



# 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**

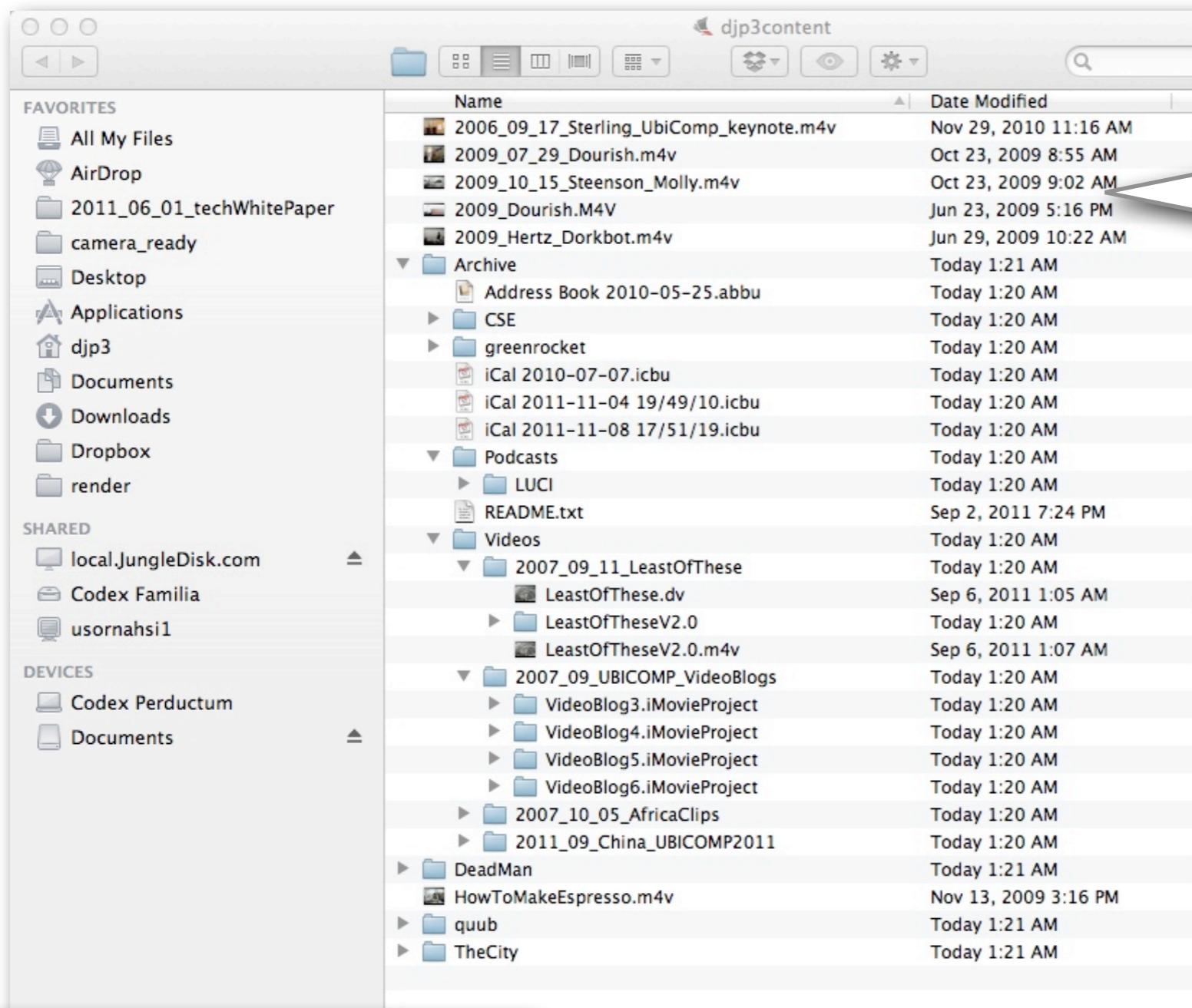
# Consumer vision : JungleDisk

File list for djp3content

Name	Date Modified	Size	Kind
2006_09_17_Sterling_UbiComp_keynote.m4v	Nov 29, 2010 11:16 AM	419.2 MB	MPEG-4 File
2009_07_29_Dourish.m4v	Oct 23, 2009 8:55 AM	284 MB	MPEG-4 File
2009_10_15_Stenson_Molly.m4v	Oct 23, 2009 9:02 AM	569.1 MB	MPEG-4 File
2009_Dourish.M4V	Jun 23, 2009 5:16 PM	616.7 MB	MPEG-4 File
2009_Hertz_Dorkbot.m4v	Jun 29, 2009 10:22 AM	99.9 MB	MPEG-4 File
Archive	Today 1:21 AM	--	Folder
Address Book 2010-05-25.abbu	Today 1:20 AM	--	Address Book
CSE	Today 1:20 AM	--	Folder
greenrocket	Today 1:20 AM	--	Folder
iCal 2010-07-07.icbu	Today 1:20 AM	--	iCal Backup file
iCal 2011-11-04 19/49/10.icbu	Today 1:20 AM	--	iCal Backup file
iCal 2011-11-08 17/51/19.icbu	Today 1:20 AM	--	iCal Backup file
Podcasts	Today 1:20 AM	--	Folder
LUCI	Today 1:20 AM	--	Folder
README.txt	Sep 2, 2011 7:24 PM	233 bytes	
Videos	Today 1:20 AM	--	Folder
2007_09_11_LeastOfThese	Today 1:20 AM	--	Folder
LeastOfThese.dv	Sep 6, 2011 1:05 AM	808.1 MB	
LeastOfTheseV2.0	Today 1:20 AM	--	Folder
LeastOfTheseV2.0.m4v	Sep 6, 2011 1:07 AM	43.6 MB	
2007_09_UBICOMP_VideoBlogs	Today 1:20 AM	--	Folder
VideoBlog3.iMovieProject	Today 1:20 AM	--	Folder
VideoBlog4.iMovieProject	Today 1:20 AM	--	Folder
VideoBlog5.iMovieProject	Today 1:20 AM	--	Folder
VideoBlog6.iMovieProject	Today 1:20 AM	--	Folder
2007_10_05_AfricaClips	Today 1:20 AM	--	Folder
2011_09_China_UBICOMP2011	Today 1:20 AM	--	Folder
DeadMan	Today 1:21 AM	--	Folder
HowToMakeEspresso.m4v	Nov 13, 2009 3:16 PM	53.9 MB	MPEG-4 File
quub	Today 1:21 AM	--	Folder
TheCity	Today 1:21 AM	--	Folder

Jungle Disk™

# Consumer vision : JungleDisk



An infinitely large hard-drive  
that never crashes

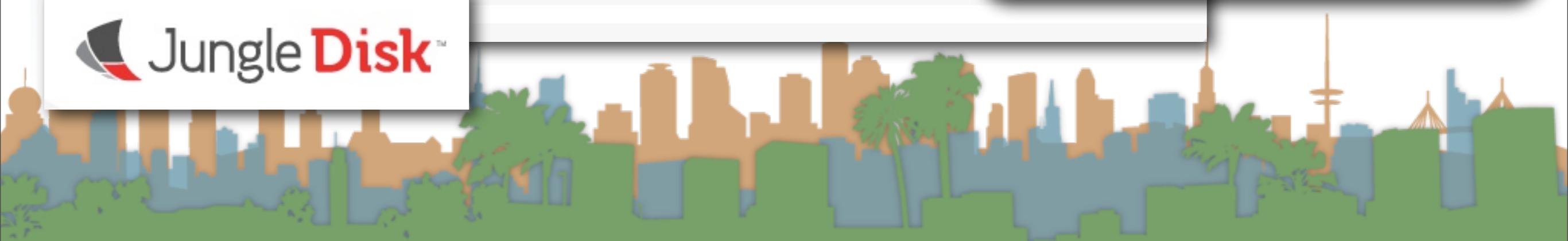
Consumers don't know where  
the data is kept.

(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**

 Jungle Disk™



# 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



# What are the visions?

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  - Rent a cloud computer



# Services vision : Google Apps

Google Apps

Amazon Simple Storage Serv... Jungle Disk - My Account Donald J. Patterson III Mail - I... Google Apps

google.com https://www.google.com/a/cpanel/djp3.net/Dashboard?pli=1 jungle disk

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Google Apps for djp3.net - Google Apps for Business d\_j\_p\_3@djp3.net Inbox Calendar Help Sign out

Google apps Search accounts Search Help Center

Dashboard Organization & users Groups Domain settings Reports Advanced tools Setup Support Settings Help

**Add Chromebooks to your Google Apps domain.**  
Fast, intuitive, and easy-to-manage laptops. Chromebooks are designed to protect data and users while increasing user productivity and dramatically reducing total cost of ownership. [Learn more](#)

Over the next few months, Google Apps is getting a new look and feel! [Learn more](#)

**Donald J. Patterson III**  
djp3.net  
[Manage account information](#) [domain names](#)

**3 users**  
You have reached the 3 user limit for this organization.

✓ All Google Apps services are running smoothly. [Learn more](#)

Seven-day active users over the last 90 days current min max 0 0 1

Current as of November 14, 2011 [Learn more](#)

**Service settings** [Add more services](#)

**Google Apps Marketplace** New  
Get more apps including accounting, CRM, marketing, project management and admin tools. [Shop the marketplace »](#)

**Core Google Apps suite**

**Email** <http://mail.google.com/a/djp3.net>

**Docs** <http://docs.google.com/a/djp3.net>

**Calendar** <http://www.google.com/calendar/hosted/djp3.net>

**Sites** <http://sites.google.com/a/djp3.net>

**Google Wave** <http://wave.google.com/a/djp3.net>

**Chat** Users can sign in by [downloading Google Talk](#)

**Video** <http://video.google.com/a/djp3.net>

**Postini Services** Postini Services let you set up email policies and filters. [Postini Services console](#)

**Mobile** Get Google Apps on your mobile device

**Start Page** <http://partnerpage.google.com/djp3.net>

Tip: Connect with other Google Apps admins in the Google Apps admin community. [Learn more](#)

[Terms of Service](#) - [Privacy policy](#) - [Suggest a feature](#) - [Google Home](#)  
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# Services vision : Google Apps

Google Apps

Amazon Simple Storage Serv... Jungle Disk - My Account Donald J. Patterson III Mail - I... Google Apps

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Google.com https://www.google.com/a/cpanel/djp3.net/Dashboard?pli=1 jungle disk

Google Apps for djp3.net - Google Apps for Business d\_j\_p\_3@djp3.net Inbox Calendar Help Sign out

Google apps Search accounts Search Help Center

Dashboard Organization & users Groups Domain settings Reports Advanced tools Setup Support Settings Help

**Add Chromebooks to your Google Apps domain.**  
Fast, intuitive, and easy-to-manage laptops. Chromebooks are designed to protect data and users while increasing user productivity and dramatically reducing total cost of ownership. [Learn more](#)

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**Google Apps Marketplace** [New](#)  
Get more apps including accounting, CRM, marketing, project management and admin tools. [Shop the marketplace »](#)

**Core Google Apps suite**

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**Calendar** <http://www.google.com/calendar/hosted/djp3.net>

**Google Wave** <http://wave.google.com/a/djp3.net>

**Video** <http://video.google.com/a/djp3.net>

**Mobile**  
Get Google Apps on your mobile device

**Docs** <http://docs.google.com/a/djp3.net>

**Sites** <http://sites.google.com/a/djp3.net>

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**Postini Services**  
Postini Services let you set up email policies and filters. [Postini Services console](#)

**Start Page** <http://partnerpage.google.com/djp3.net>

Tip: Connect with other Google Apps admins in the Google Apps admin community. [Learn more](#)

[Terms of Service](#) - [Privacy policy](#) - [Suggest a feature](#) - [Google Home](#)  
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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 | User Community | Blog | Support | Send

visit December 20, 2007 3:28 PM PST

My Finances

Show Custom range ▾ Jan Feb Mar Apr May

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

Not sure where to start?

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

= So, I Overspent... Nov 20 - Dec 20 -\$245.81

Ask the Community

Manage bill reminders (for all accounts and dates)

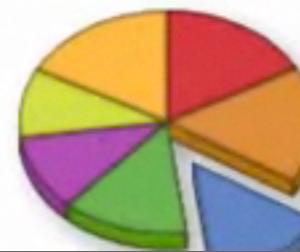
Stop Reminders for this Payee Mark as Paid Send to Email/Phone

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

What am I spending money on?

Nov 20 - Dec 20

Have a question about the pie chart?



# Services vision : Quicken Online

The screenshot shows the Quicken Online dashboard. On the left, there's a sidebar for 'My Accounts' with buttons for 'Add', 'Edit', and 'Delete'. It lists 'Bank Accounts' (Customer Central Bank, My Checking balance \$257.14, My Savings balance \$100,000.00, Total \$100,257.14) and 'Credit Cards' (Customer Central Bank, Credit Card balance -\$2,436.50, Total -\$2,436.50). A 'Total Balance' of \$97,820.64 is also shown. A 'Not sure where to start?' link is at the bottom. The main area has a title 'Am I living within my means?' with a green box for 'Money In' (\$108.99) and an orange box for 'Money Out' (\$354.80). Below this is a 'Manage bill reminders' section with a table of upcoming payments:

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

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



# What are the visions?

- Consumer
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# Infrastructure: Amazon web services

AWS Management Console

amazon.com https://console.aws.amazon.com/ec2/home?region=us-east-1

Donald J. Patterson | Help ▾

**AWS Management Console > Amazon EC2**

**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 <a href="#">View complete service health details</a>

**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

**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
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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)

# Infrastructure: Amazon web services

AWS Management Console

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AWS Management Console > Amazon EC2

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Create an auto-scaling Tomcat environment in 2 minutes

“easy to begin, impossible to outgrow”

\$35.27/month for basic usage

View complete service health details

Availability Zone Status

Current Status	Details
✓ us-east-1a	Availability zone is operating normally
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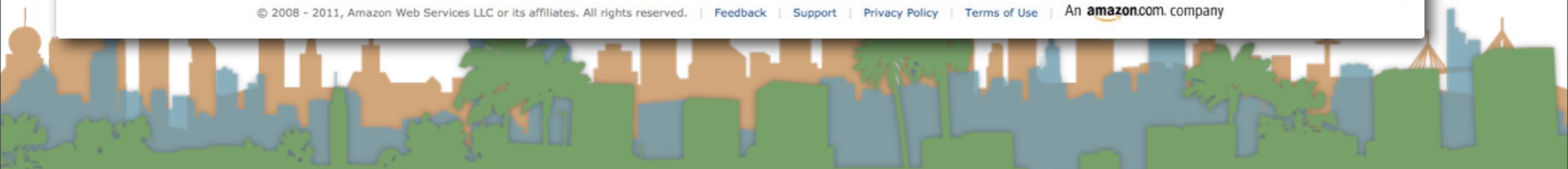
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**Create an infinitely large database instantly**

**\$0.11/hour**

0 Load Balancers 0 Placement Groups

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**Create a data-flow process to compute on massive data sets**

**\$0.015/hour**

View EC2 resources in the US East

Refresh

0 Elastic IPs

0 EBS Snapshots

2 Security Groups

0 Placement Groups

0 Load Balancers

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# Infrastructure: Heroku platform services

Heroku | How it Works

Heroku | How it Works

www.heroku.com/how

Press This Class Develop... UCI DR quub Blogs and Wikis 960 Gridder Rails Bookmarks

# heroku

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

Build Operate

Deploy Connect Command Observe Scale Relax

**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.

Control Surface APIs

Routing

Dynos

Process Types

Dyno Manifold

Logplex

...

Heroku

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Success Stories

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Platform

How It Works

Pricing

Add-ons

Resources

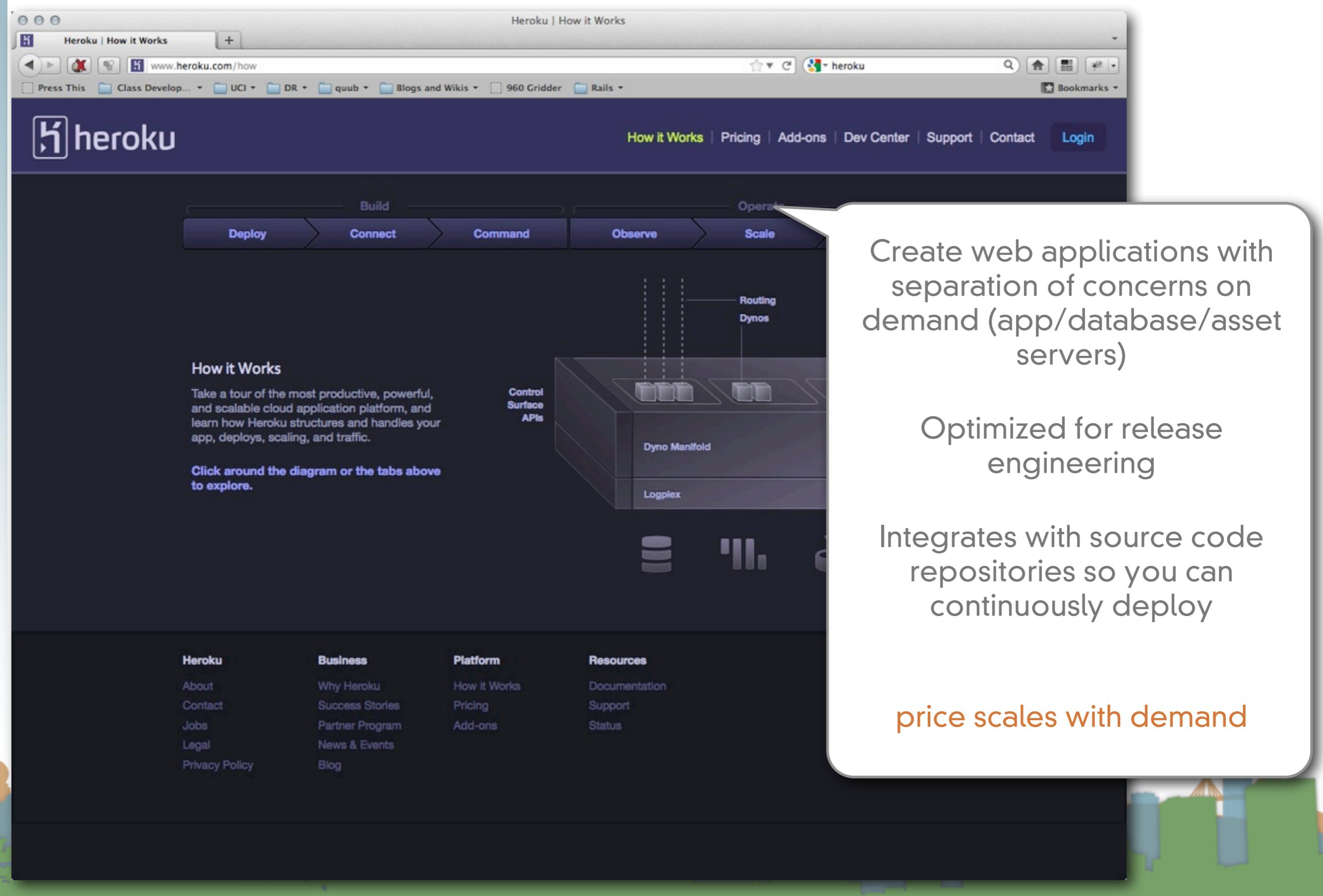
Documentation

Support

Status



# Infrastructure: Heroku platform services



The screenshot shows the Heroku 'How it Works' page. At the top, there's a navigation bar with links to 'How it Works', 'Pricing', 'Add-ons', 'Dev Center', 'Support', 'Contact', and 'Login'. Below the navigation is a horizontal navigation bar with tabs: 'Build' (with 'Deploy', 'Connect', 'Command' sub-tabs), 'Operate' (with 'Observe', 'Scale' sub-tabs), and a large diagram. The diagram illustrates the Heroku architecture: 'Control Surface APIs' (represented by a grey box) interact with a 'Dyno Manifold' (represented by a stack of grey boxes) and a 'Logplex' (represented by a stack of grey boxes). A 'Routing Dynos' label points to the top of the Dyno Manifold. Below the diagram, there's a section titled 'How it Works' with a description and a link to 'Click around the diagram or the tabs above to explore.'

**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

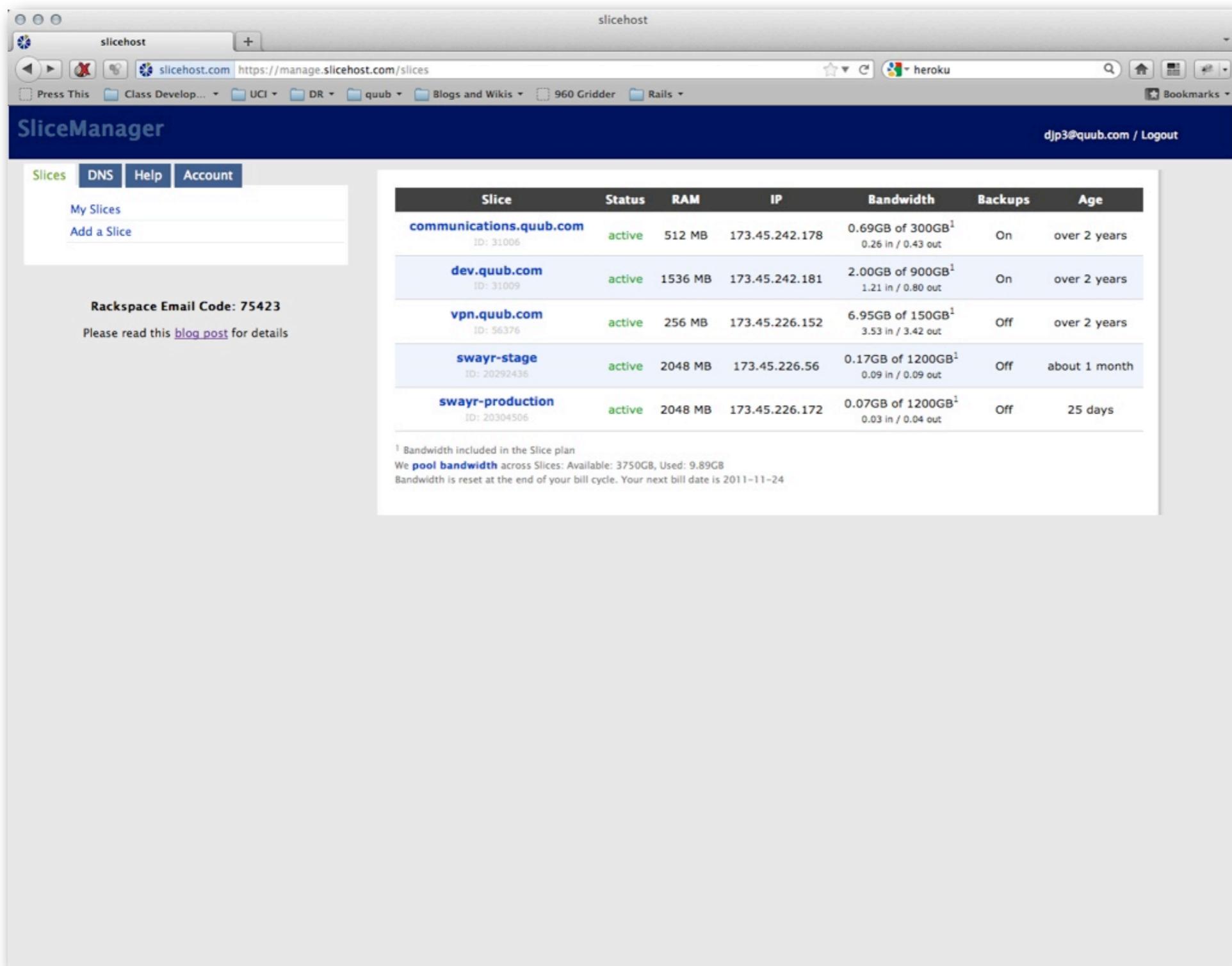


# What are the visions?

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# Virtual Machines: Slicehost



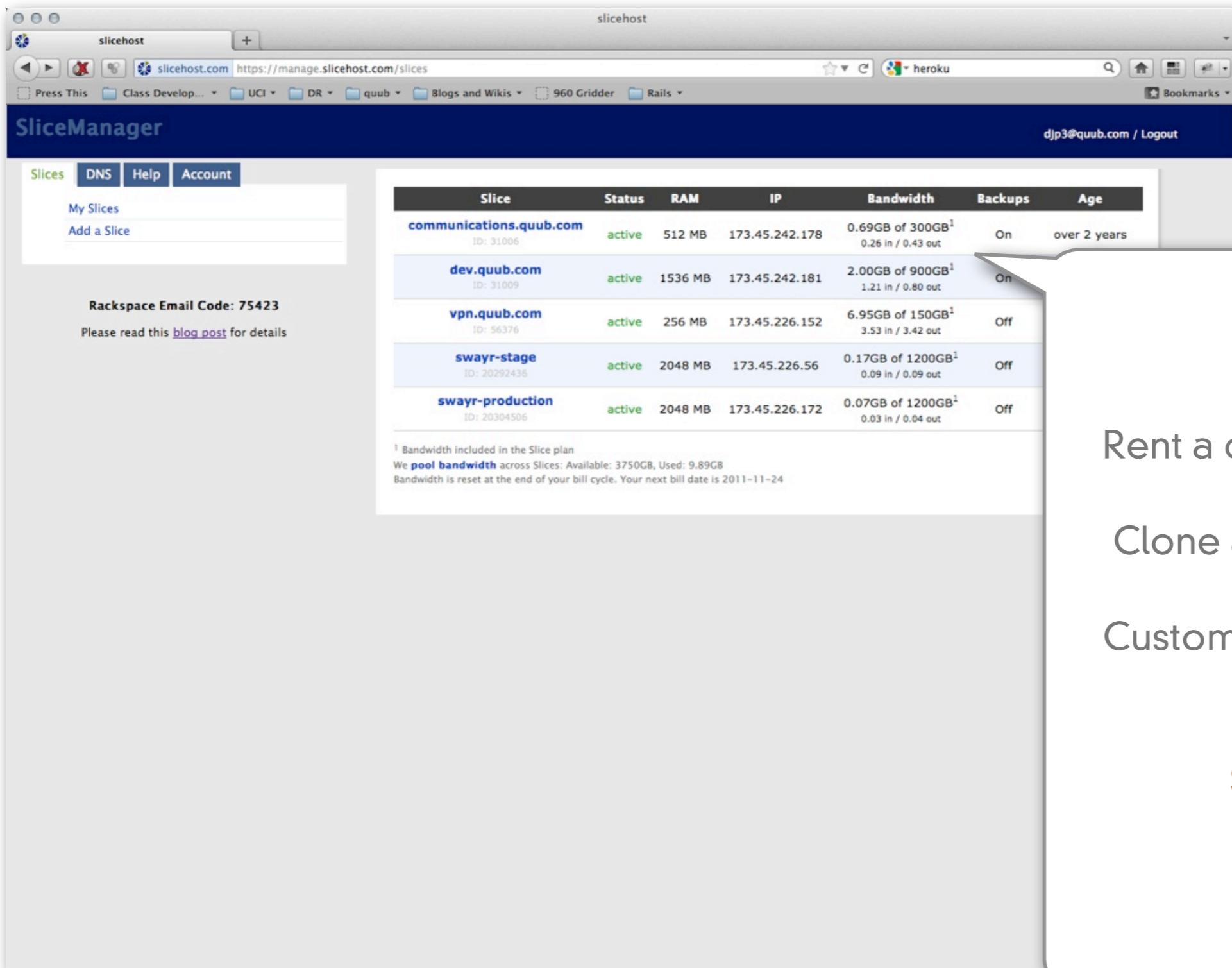
The screenshot shows a web browser window titled "slicehost" displaying the SliceManager interface. The URL is <https://manage.slicehost.com/slices>. The top navigation bar includes links for "Slices" (which is active), "DNS", "Help", and "Account". The top right shows the email "djp3@quub.com / Logout".

The main content area is titled "SliceManager" and displays a table of "My Slices". The table has columns for "Slice", "Status", "RAM", "IP", "Bandwidth", "Backups", and "Age".

Slice	Status	RAM	IP	Bandwidth	Backups	Age
<a href="#">communications.quub.com</a> ID: 31006	active	512 MB	173.45.242.178	0.69GB of 300GB <sup>1</sup> 0.26 in / 0.43 out	On	over 2 years
<a href="#">dev.quub.com</a> ID: 31009	active	1536 MB	173.45.242.181	2.00GB of 900GB <sup>1</sup> 1.21 in / 0.80 out	On	over 2 years
<a href="#">vpn.quub.com</a> ID: 56376	active	256 MB	173.45.226.152	6.95GB of 150GB <sup>1</sup> 3.53 in / 3.42 out	Off	over 2 years
<a href="#">swayr-stage</a> ID: 20292436	active	2048 MB	173.45.226.56	0.17GB of 1200GB <sup>1</sup> 0.09 in / 0.09 out	Off	about 1 month
<a href="#">swayr-production</a> ID: 20304506	active	2048 MB	173.45.226.172	0.07GB of 1200GB <sup>1</sup> 0.03 in / 0.04 out	Off	25 days

<sup>1</sup> 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

# Virtual Machines: Slicehost



The screenshot shows the SliceManager interface for managing virtual machines on Slicehost. The main menu includes Slices, DNS, Help, and Account. The Slices tab is selected, showing a list of five virtual machines:

Slice	Status	RAM	IP	Bandwidth	Backups	Age
communications.quub.com ID: 31006	active	512 MB	173.45.242.178	0.69GB of 300GB <sup>1</sup> 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 <sup>1</sup> 1.21 in / 0.80 out	On	
vpn.quub.com ID: 56376	active	256 MB	173.45.226.152	6.95GB of 150GB <sup>1</sup> 3.53 in / 3.42 out	Off	
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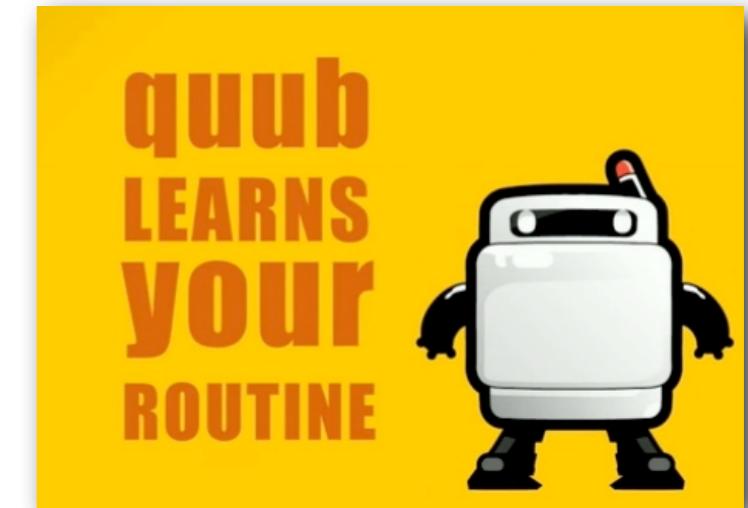
Rent a computer on demand

Clone an existing computer

Customer does all the admin

\$40.00 / month

## What is my experience?



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



## What is my experience?

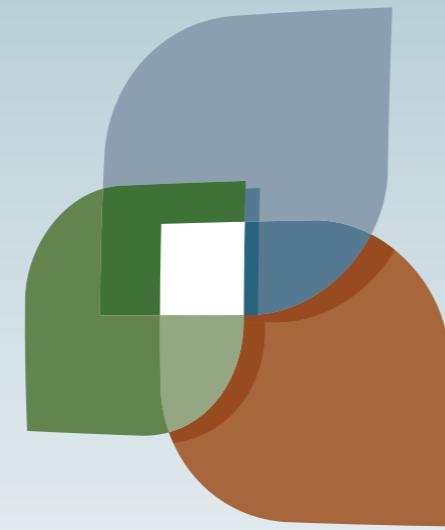
- Robustness is hard
  - Ambulance
  - Latency works against you
- Dealing with venture capitalists is rough
  - selling the future (bump)
  - “build a great company”
- Tried to go into China
  - microblog monitoring
  - copied the product
  - car logger



## 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





L U C I

