



On the Cloud Computing Frontier

Preparing for the Perfect Storm

Generation Z
Extreme Mobility
The Internet of Things

www.huawei.com

David Bernstein
Special CTO and VP, Software
Huawei Technologies, Ltd

dbernstein@huawei.com



The Fifth International Conference on Systems and
Networks Communications

ICSNC 2010

August 22-27, 2010 - Nice, France

We are at a **BIG CHANGE**

Tech Cycles Tend to Last Ten Years
Entered Next Major Computing Cycle – Mobile Internet – 2 Years Ago

*Mainframe
Computing
1960s*



*Mini
Computing
1970s*



*Personal
Computing
1980s*



*Desktop Internet
Computing
1990s*



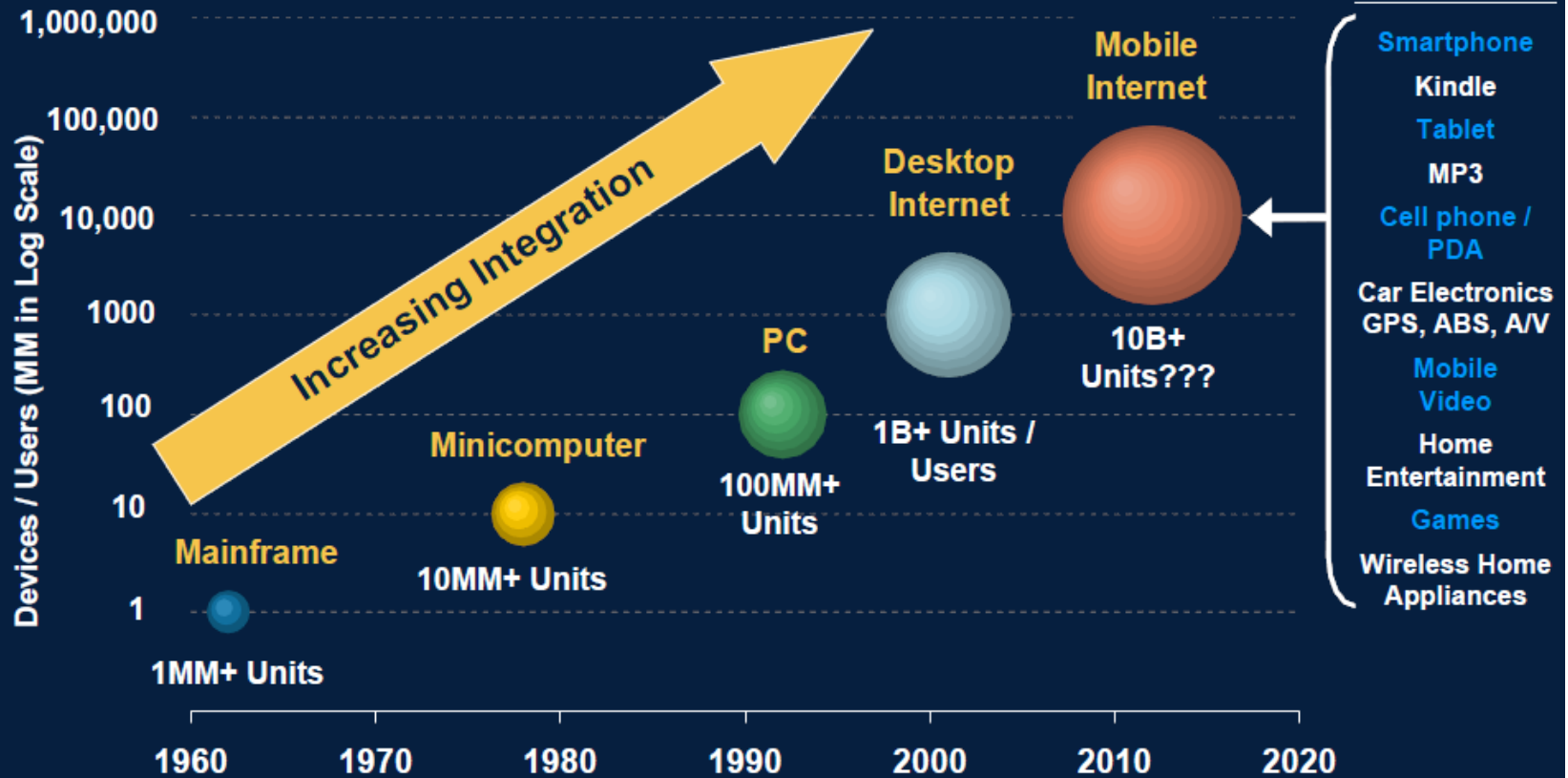
*Mobile Internet
Computing
2000s*



New Computing Cycle Characteristics

Reduce Usage Friction Via Better Processing Power + Improved User Interface + Smaller Form Factor + Lower Prices + Expanded Services = 10x More Devices

Computing Growth Drivers Over Time, 1960 – 2020E



Morgan Stanley

Note: PC installed base reached 100MM in 1993, cellphone / Internet users reached 1B in 2002 / 2005 respectively; Source: ITU, Mark Lipacis, Morgan Stanley Research.

Security Level:

Generation Z

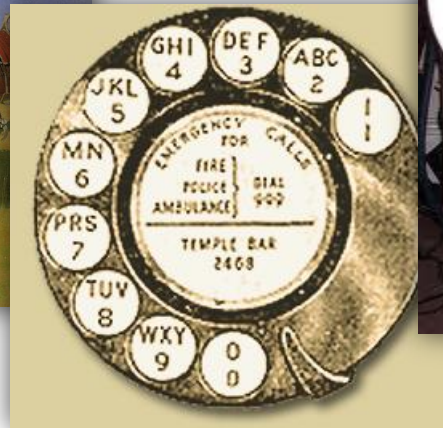
www.huawei.com



Generation Z

- **The “Digital Generation”**
- **Never knew life, before Mobile Phones or the Internet**
- **Born after 1994 and before 2004**
- **Generation Z makes up for nearly 18 percent of the world’s population**
- **Poised to enter the workforce**

Stuff from The "Olden Days"



2018 we reach more than 8 billion people worldwide, 5 billion have a mobile phone, 2.5 billion including mobile internet access.

2018



2018

10 Years ago we had 2 things in our pockets

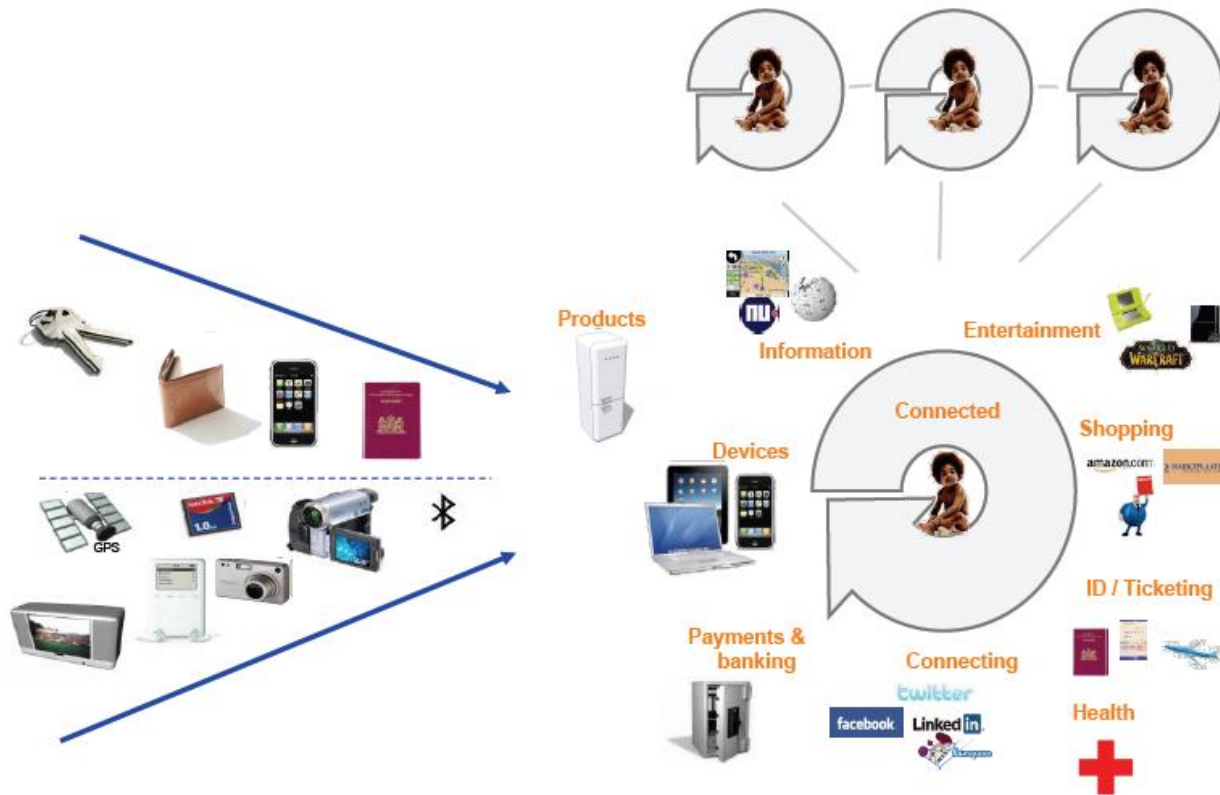


now it's 3 things



(and it's the most important)

Everything is now connected



Voice Calls on the Decline

Wired Magazine Story Says the Phone Call Is Fading Away; Aug. 9, 2010—

- *The average number of mobile phone calls we make every year is dropping*
- *Calls are getting shorter; In 2005, the average call was three minutes long, now they're not even half of that*
- *Between 2008 and 2010, the average number of voice minutes used by adults 18-24 dropped from about 1200 to 900*



News Front Page



Africa

Americas

Asia-Pacific

Europe

Middle East

South Asia

UK

Business

Health

**Science &
Environment**

Technology

Entertainment

Also in the news

[✉ E-mail this to a friend](#)

[🖨️ Printable version](#)

Hyper-connected generation rises

By Darren Waters

Technology editor, BBC News website

Internet services such as Twitter, Jaiku and Kyte TV are giving rise to a "hyper-connected" generation.

An increasing number of applications has been launched that take advantage of "always on" connections, either over the net or on mobile devices.

Users are not just sending texts and e-mails, but are "lifecasting" words and video 24 hours a day.



Mobiles are helping form the always-on network

If VoIP Leader Skype Were a Carrier, it Would be Largest 'Carrier' in World

521MM Registered Users (+41% Y/Y) & +8% of Cross-Border Calling Minutes

Rank*	Company	Type	Region	Subscribers (MM)	Y/Y Growth	Blended ARPU (US\$)	Y/Y Growth	Market Cap (\$B)
1	China Mobile	Wireless	China	493	19%	\$11	-10%	\$192
2	Vodafone	Wireless	Europe	303	23	37	3	123
3	Telefonica Moviles / O2	Wireless	Europe / LatAm	206	9	41	-9	137
4	China Telecom	Wireline	China	194	-9	11	4	38
5	America Movil	Wireless	LatAm	194	13	13	4	80
6	Telenor	Wireless	Europe / Asia	172	8	20	-3	24
7	T-Mobile	Wireless	Europe / USA	150	6	37	-3	64
8	China Unicom	Wireless	China	145	10	6	-4	32
9	Orange	Wireless	Europe	129	9	50	0	69
10	Bharti Airtel	Wireless	India	111	43	5	-22	25
11	China Unicom ⁽¹⁾	Wireline	China	108	10	9	-18	32
12	MTN Group	Wireless	Africa	108	34	15	-2	28
13	Mobile TeleSystems	Wireless	Europe	101	2	8	-28	20
14	Orascom	Wireless	Africa / Asia	89	12	6	-11	24
15	Verizon Wireless	Wireless	USA	86	6	51	-2	86
16	AT&T Mobility	Wireless	USA	82	9	51	1	155
17	Telkom Indonesia	Wireless	Asia	80	32	3	-13	19
18	Telecom Italia Mobile	Wireless	Europe / LatAm	72	2	37	2	30
19	VimpelCom	Wireless	Russia	61	20	13	7	6
20	NTT docomo	Wireless	Japan	55	2	61	-8	64
21	AT&T ⁽²⁾	Wireline	USA	54	-3	80	-1	155
22	Deutsche Telekom	Wireline	Europe	54	-2	62	0	64
23	BSNL ⁽³⁾	Wireless	India	52	44	3	-35	-
24	Turkcell	Wireless	Europe	49	-4	13	-24	15
25	China Telecom	Wireless	China	47	-	8	-	38
Total				3,195	10%	\$23	2%	\$1,520

Skype ⁽⁵⁾
521MM
Registered
Users
(+41% Y/Y)

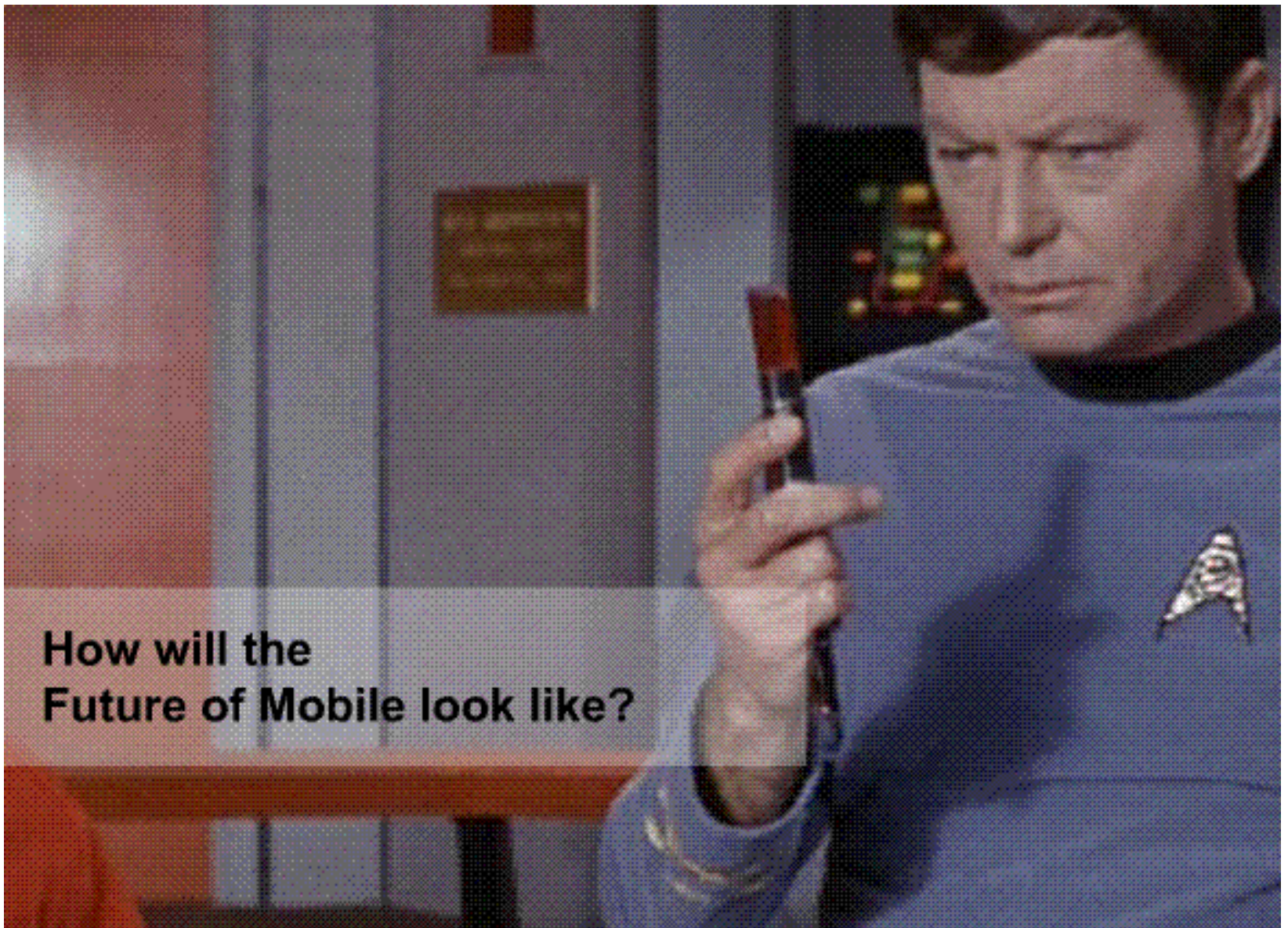
* Ranking is based on subscribers. Subscribers / ARPU data as of latest quarter (CQ3:09 or CH1:09 for some carriers who report on semi-annual basis). Market Cap as of 11/17/09. Total market value excluding duplicates = \$1,231MM; (1) China Netcom merged with China Unicom in 10/08; (2) AT&T / Verizon / DT's wireline ARPU is revenue per RGU (revenue generating unit) and include business lines; (3) BSNL is owned by the Indian government. (5) Subscriber figure for Skype is registered user amount as of CQ3:09, cross-border calling minutes as of C2008, per Telegeography. Source: Company Reports, Telegeography, Morgan Stanley Research.

Security Level:

Extreme Mobility

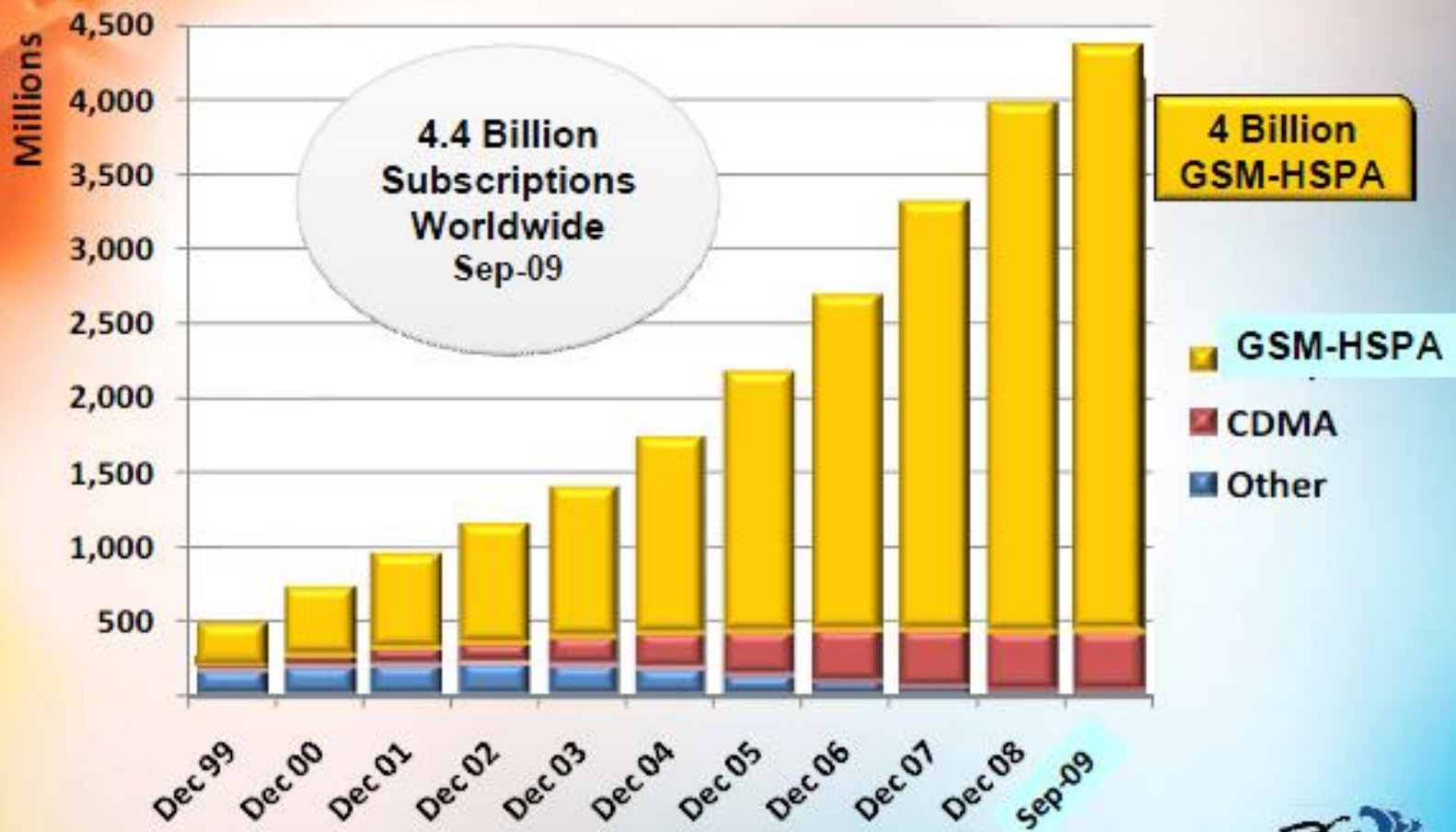
www.huawei.com





**How will the
Future of Mobile look like?**

A Decade of Technology Growth



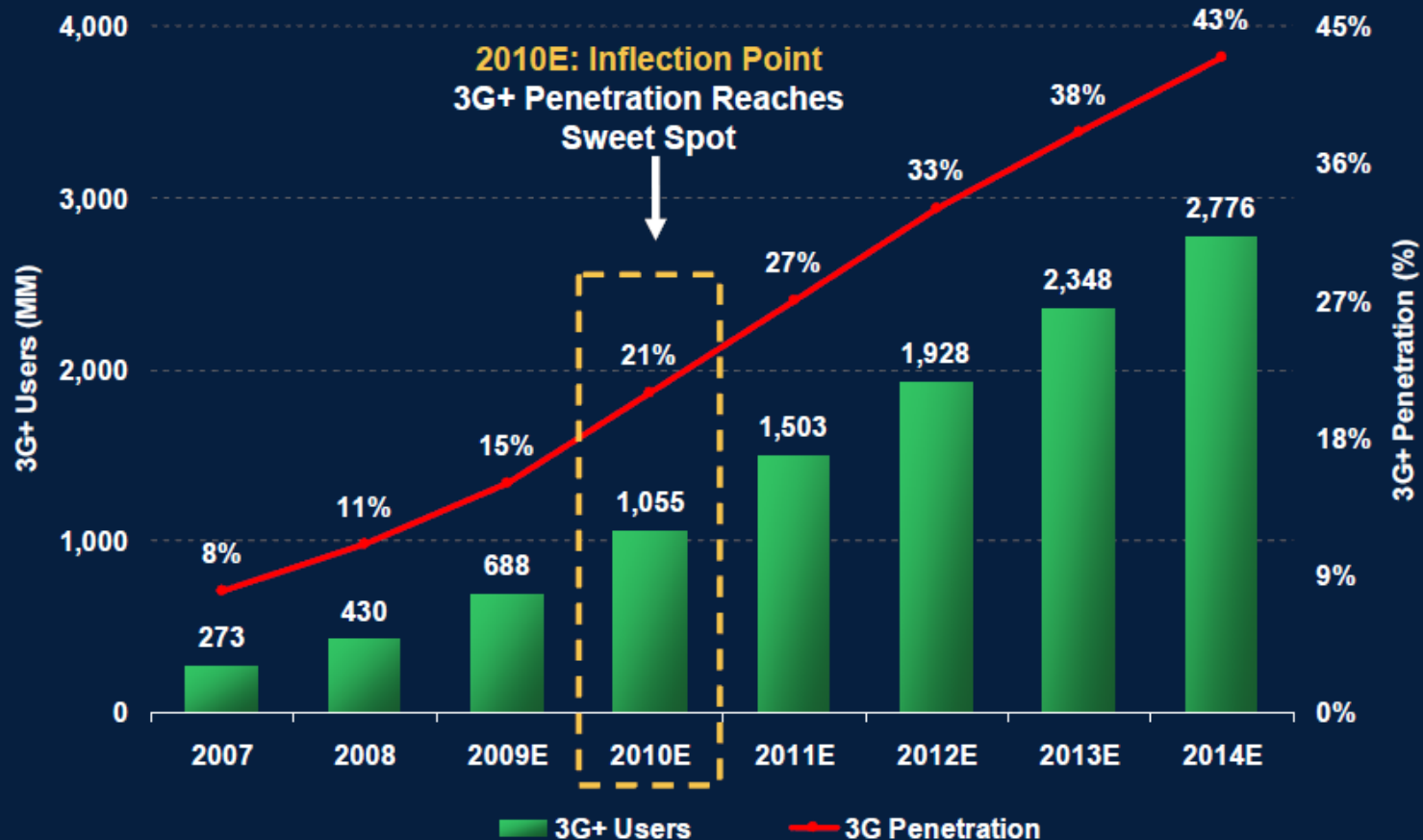
Source: Informa Telecoms & Media, WCIS+, September 2009

3G
AMERICAS

www.3gamericas.org

Global 3G Subscribers = 2010E 'Mainstream' Inflection Point, Penetration >20%

Global 3G+ Subscribers & Penetration, 2007 – 2014E



Morgan Stanley

Note: 3G+ technologies include WCDMA, HSPA, TD-SCDMA, 1xEV-DO, LTE and WiMax.
Source: Ovum Estimates, Morgan Stanley Research.

25

What My Phone has Become

Location-Based Services
Priceline.com iPhone App
Finds hotel deals in your area

Transparent Pricing
ShopSavvy Android App
Comparison shopping among online + local stores

Deep Discounts
Gilt iPhone App
Designer handbags Up to 70% Off

Immediate Gratification
iTunes Store on iPhone
Music / video / apps delivered wirelessly



Google voice

Teach your phone new tricks

Google Voice enhances the existing capabilities of your phone, regardless of which phone or carrier you have - for free. It also gives you:

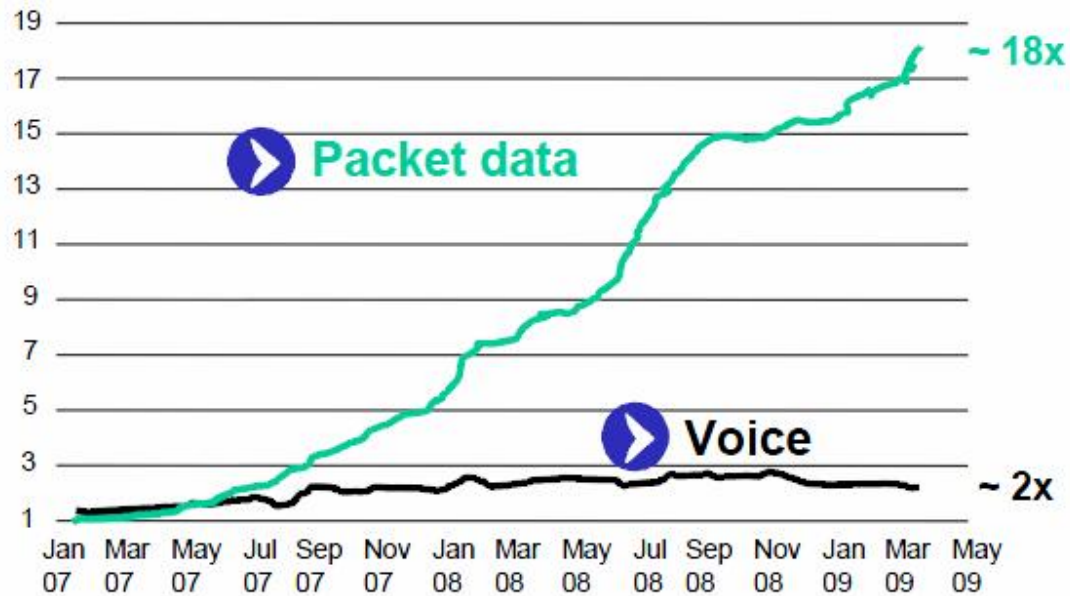
- One Number**
Use a single number that rings you anywhere.
- Online voicemail**
Get transcribed messages delivered to your inbox.
- Cheap calls**
Free calls & text messages to the U.S. & Canada. Super low rates everywhere else.



The Rise and Rise of Data

UMTS-HSPA Voice and Data Traffic

Relative Network Load



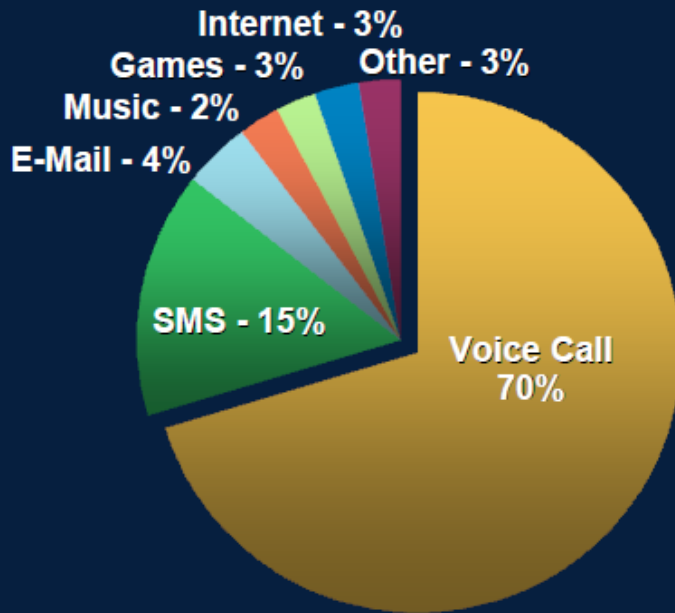
Source: 3G Americas/HSPA to LTE-Advanced: 3GPP Broadband Evolution to IMT-Advanced/Peter Rysavy Sept 2009

www.3gamerica.org

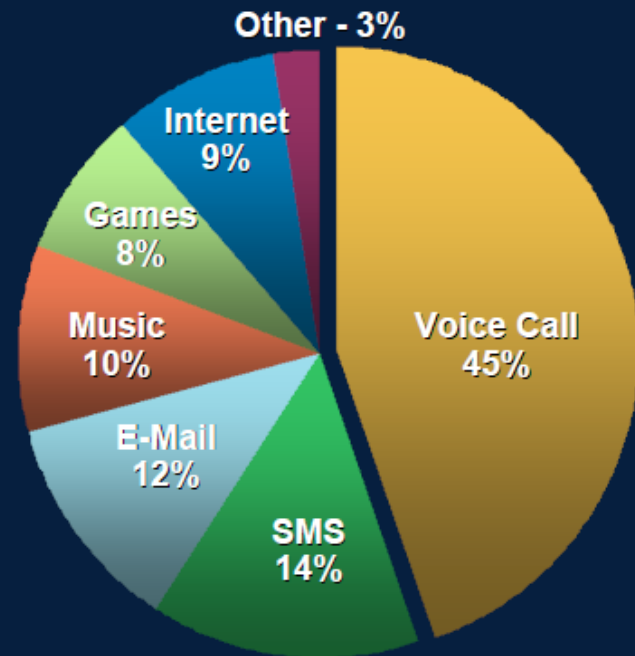
Increasingly, Mobile Phone Usage is About Data, Not Voice = Average Cell Phone = 70% Voice...iPhone = 45% Voice

Daily Usage Breakdown, % of Time Spent on Each Activity

Average US Cell Phone User
40 Minutes Per Day



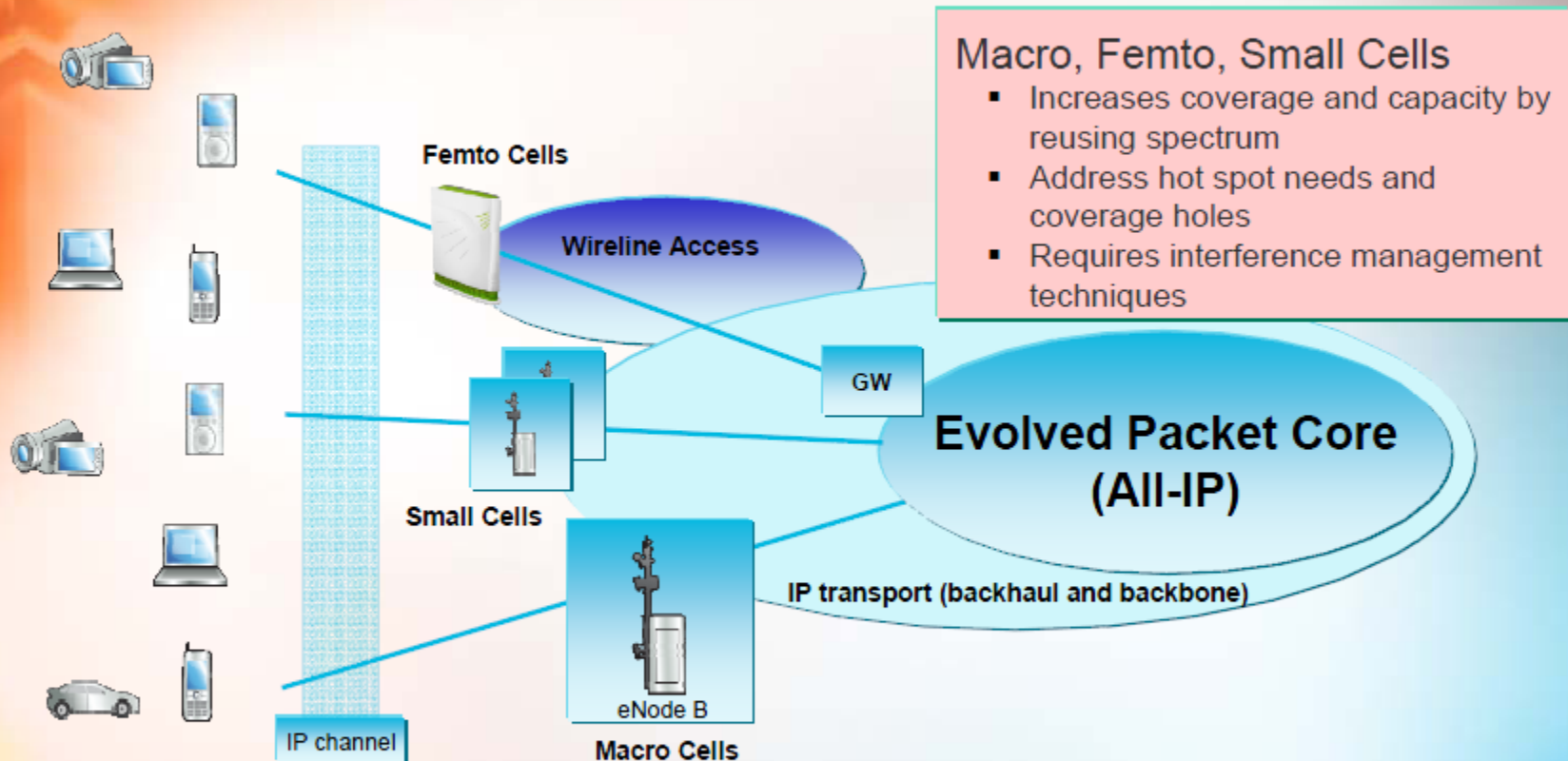
iPhone User
60 Minutes Per Day



Note: CTIA estimates average voice call time per day is 27 minutes, assuming 70% of total time spent is on voice call, per iSuppli, total average time spent on cell phone is approx. 40 minutes per day. iPhone time spent per day is our estimates. Source: iSuppli ConsumerTrak survey, 10/08, Morgan Stanley Research.

Increasing Coverage and Capacity

Heterogeneous Networks with Macro, Small, and Femto Cells

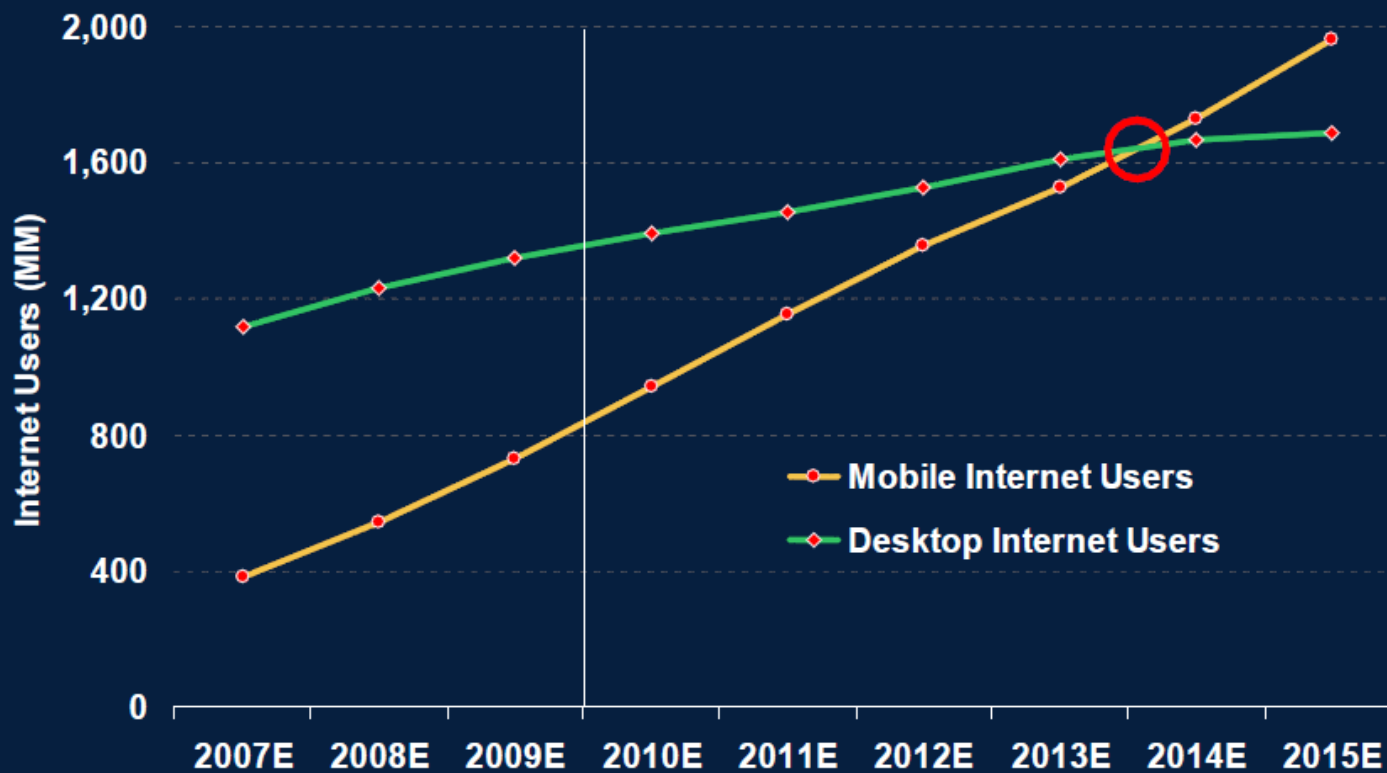


LTE+EPC

Heterogeneous Network Deployments Provide both Capacity and Coverage

Mobile Users > Desktop Internet Users Within 5 Years

Global Mobile vs. Desktop Internet User Projection, 2007 – 2015E



Morgan Stanley

Source: Morgan Stanley Research.

Security Level:

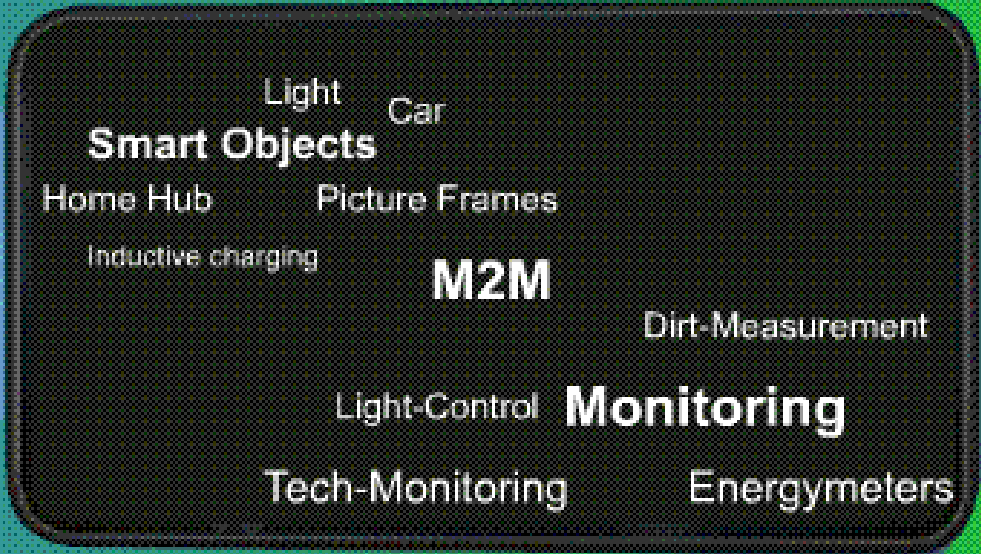
The Internet Of Things

www.huawei.com



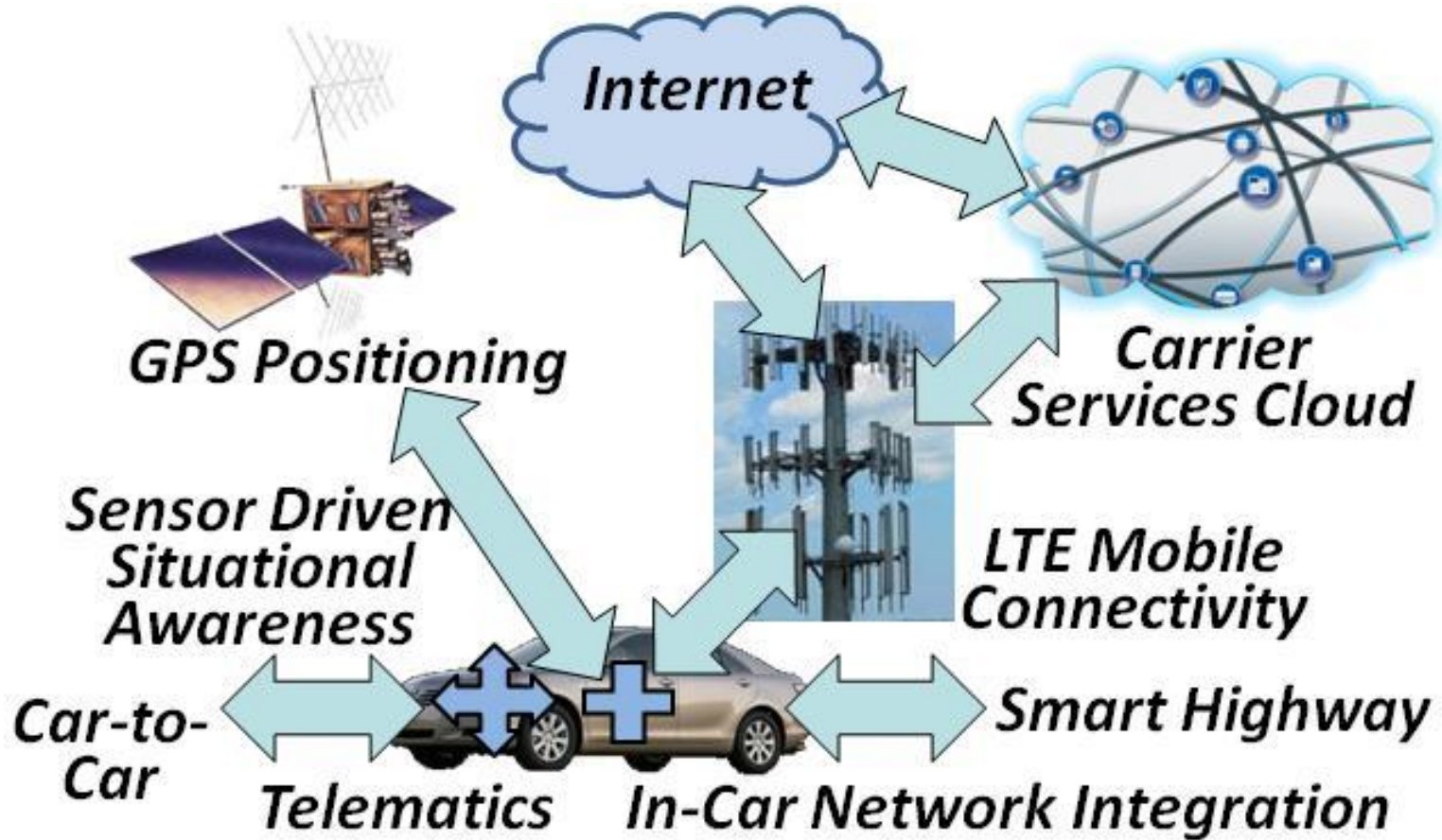
2012 we reach the barrier of
1 Trillion Networked Devices.
Machine 2 Machine (M2M)
communication, Smart Objects,
Ubiquitous Computing create the
Internet of things.

2012

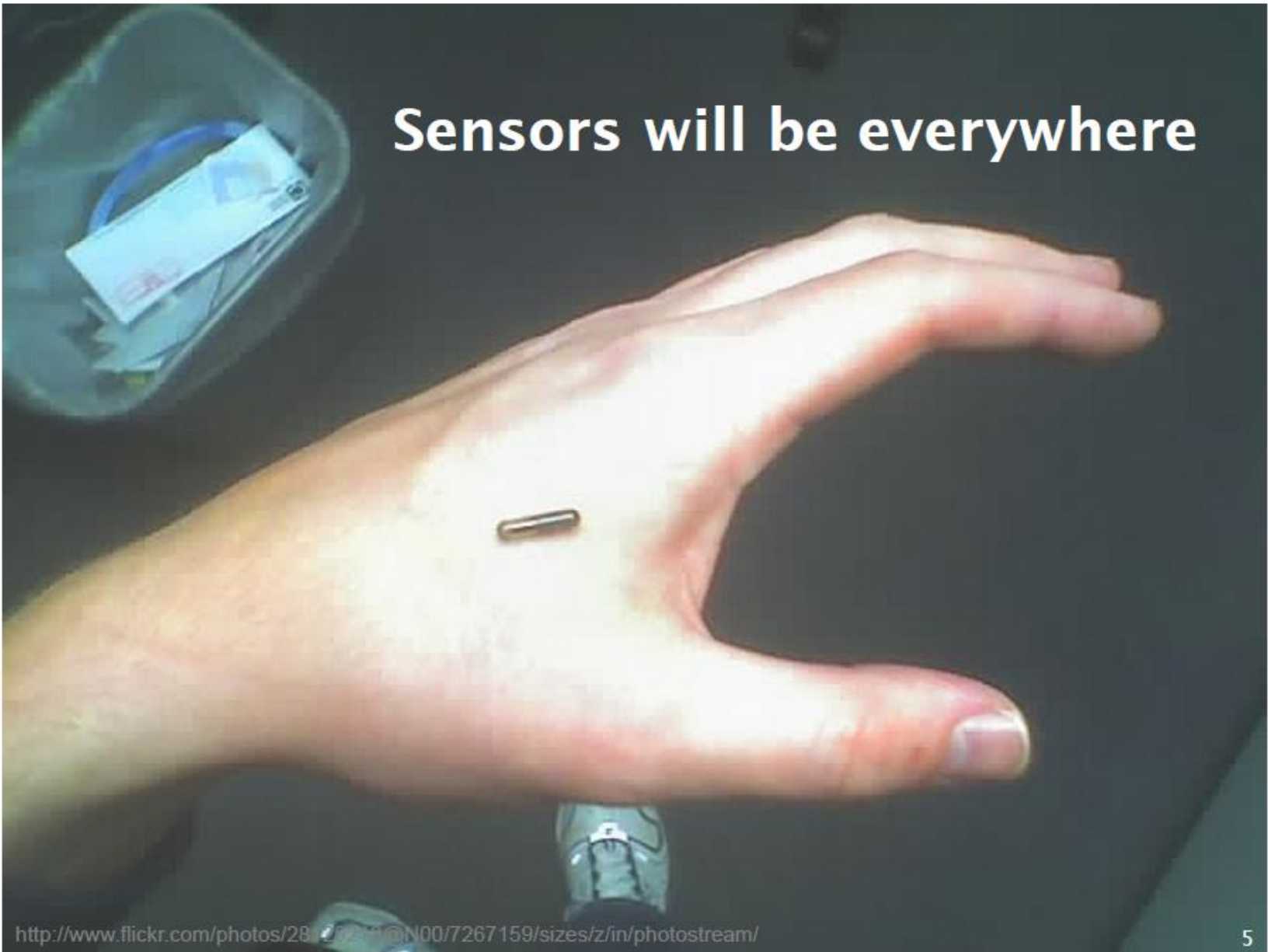


2012

Fully Connected Car



Sensors will be everywhere



<http://www.flickr.com/photos/2877224@N00/7267159/sizes/z/in/photostream/>

5

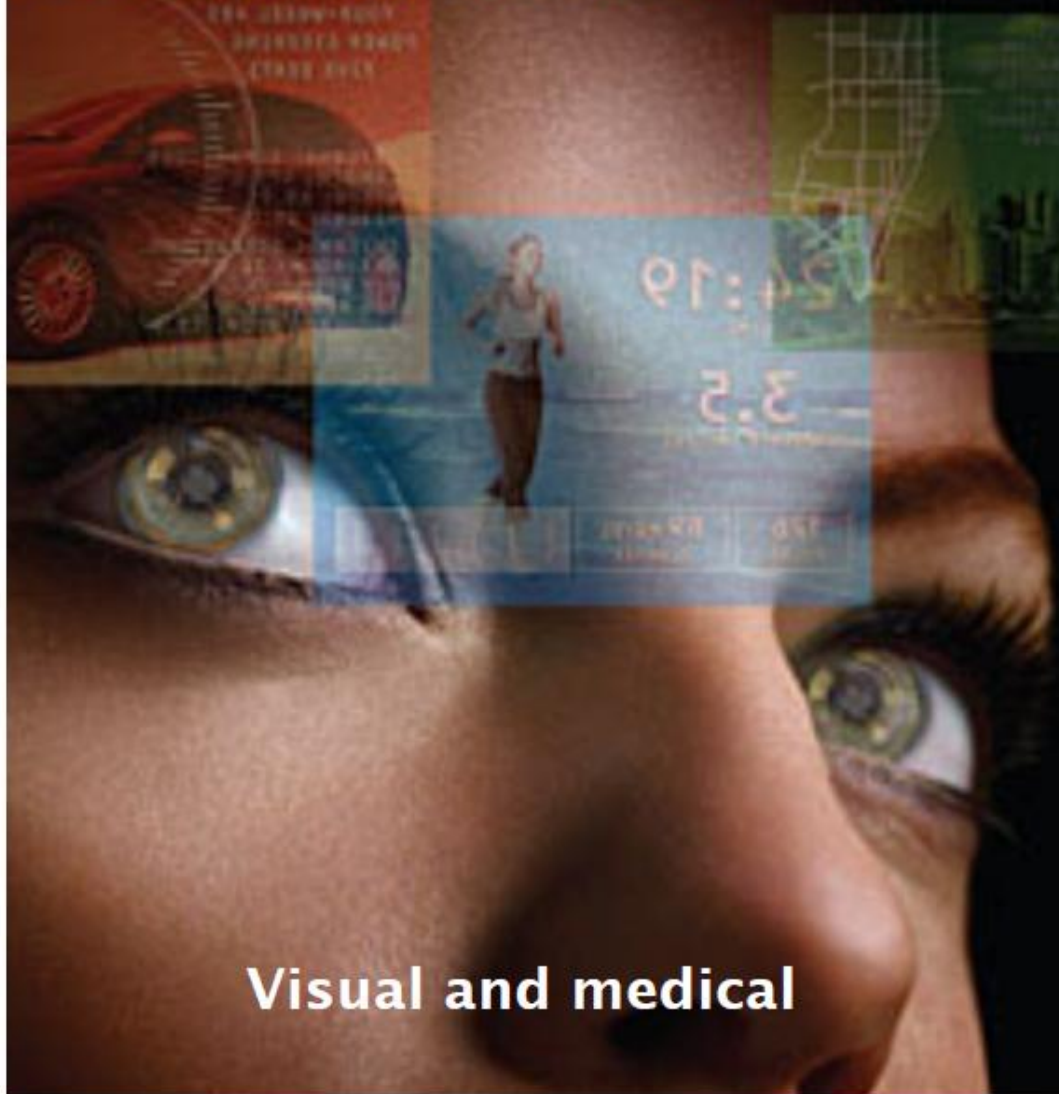
On or even
in people



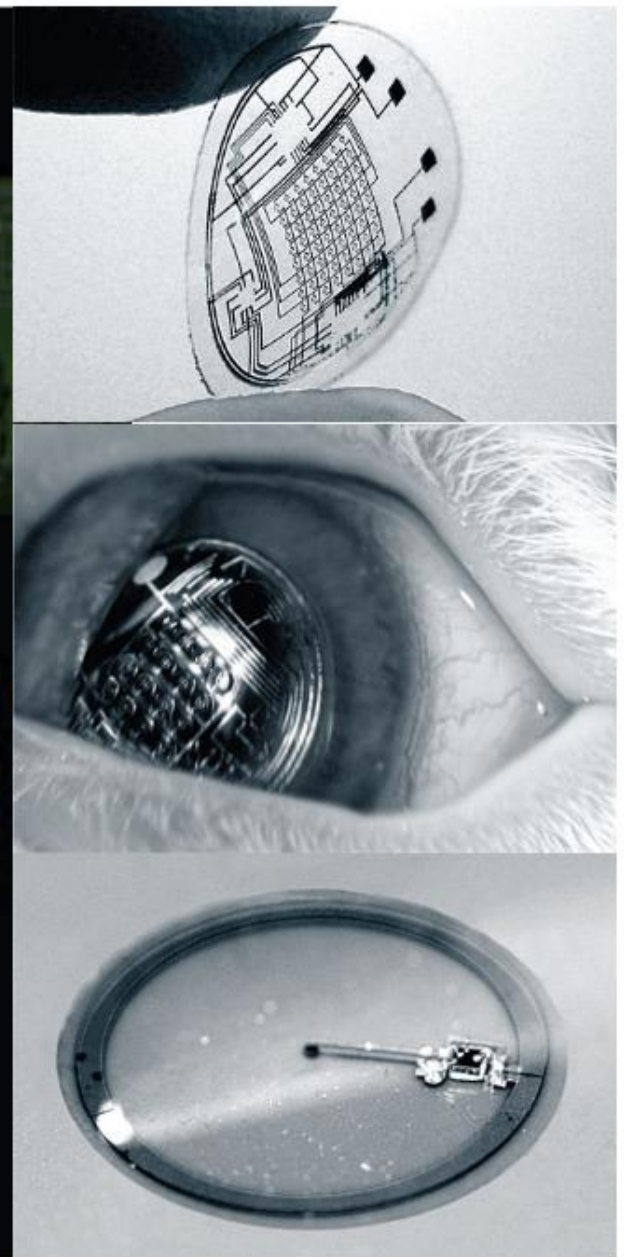
<http://www.flickr.com/photos/28126271@photo07/267164/sizes/z/in/set-181299/>

6

Sensors in contact lenses



Visual and medical



Security Level:

Cloud Computing

www.huawei.com



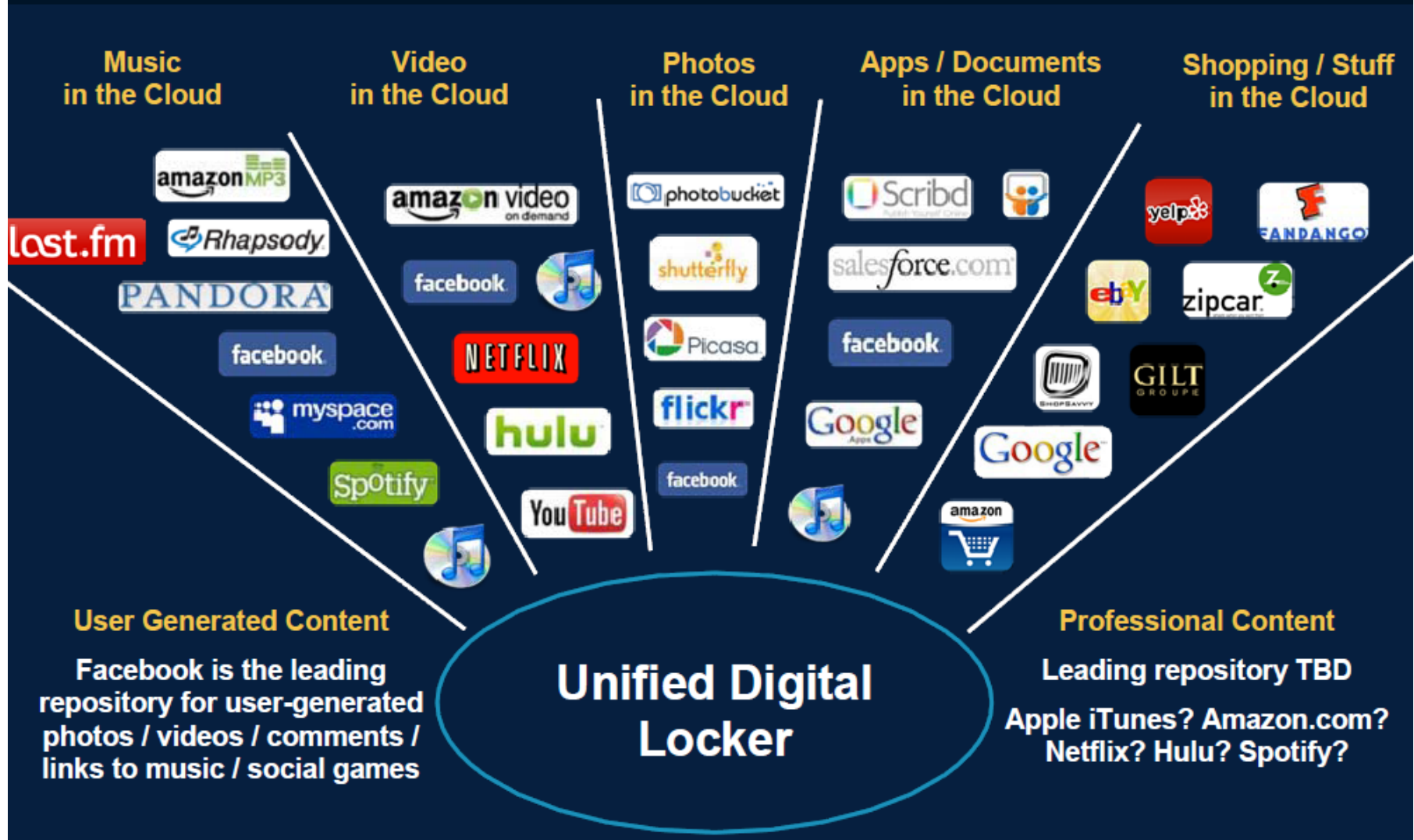


What happens in Vegas...

**Stays on Youtube, Facebook, Twitter,
Flickr, etc**

Connectivity = Cloud Computing

Consumers Expect to Get Their Stuff 24x7 from Palms of Their Hands

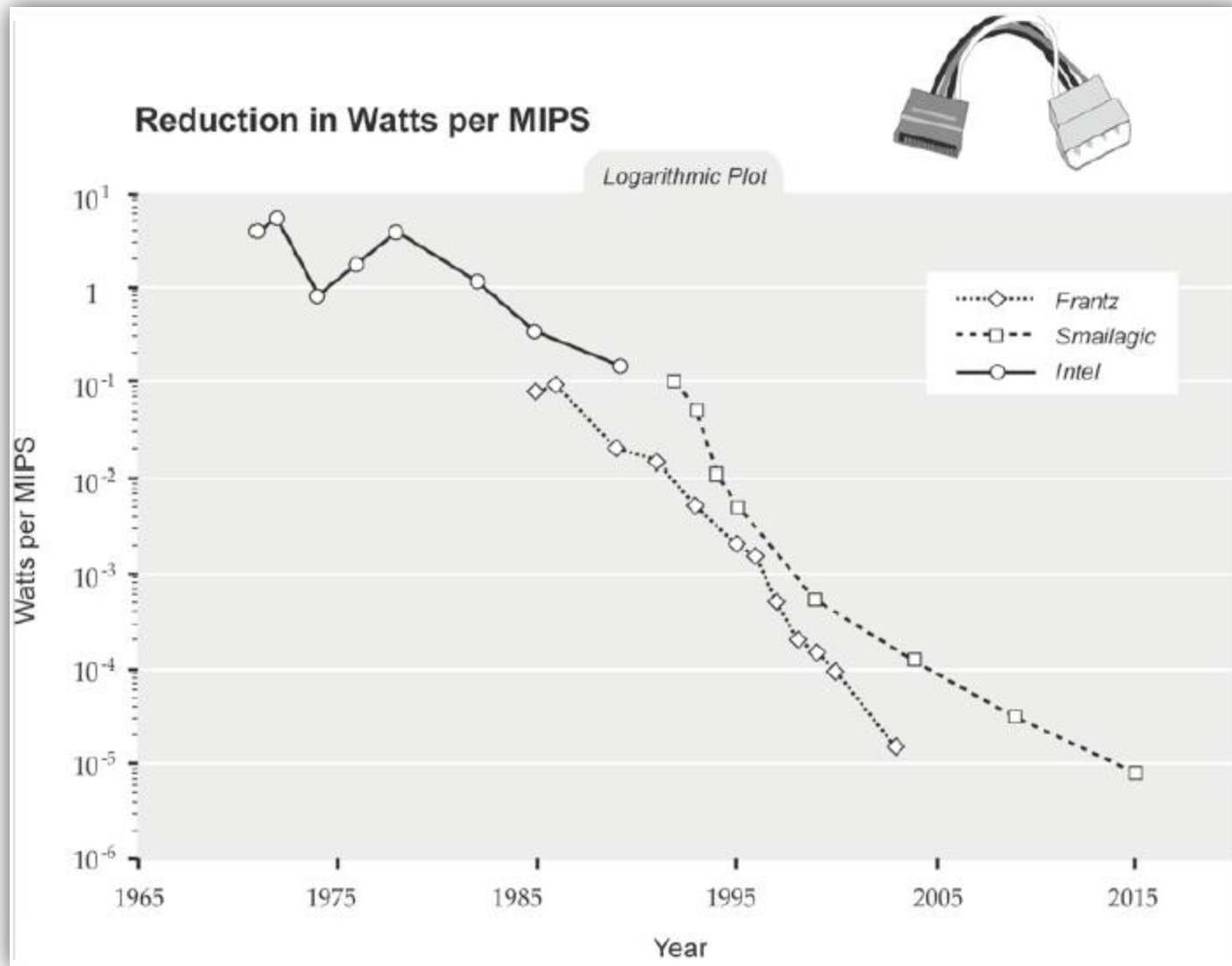


Cloud Computing is How.



Planet Size Scale
Nothing is lost
Energy Efficiency

Old Hardware is too expensive to keep running



Apple Newest Data Center

- 500,000 square feet
- \$1 billion
- Five times the size of Apple's existing Calif. Center



Microsoft's Ireland Data Center



MS Container Datacenter Containers



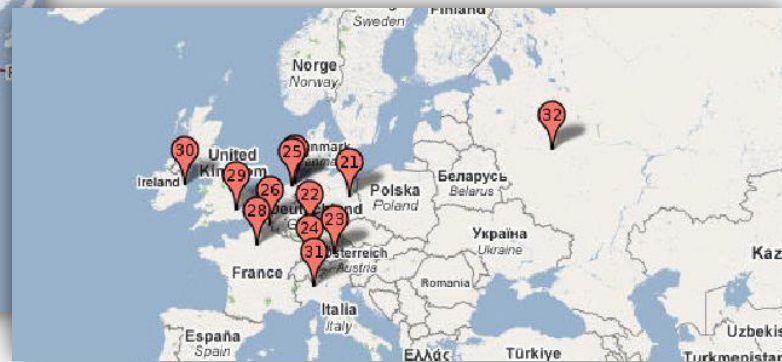
Facebook New Datacenter



Google Data Center



Scale of Google

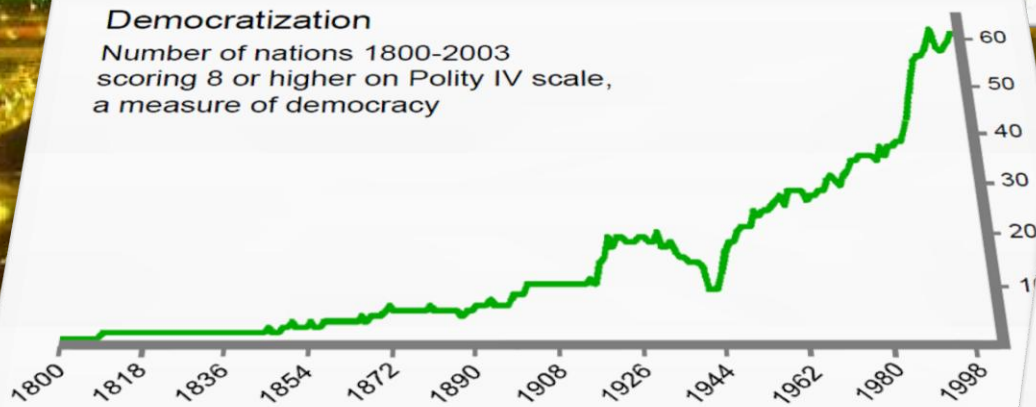


Instant Communication across the globe – the good and the bad



Democratization

Number of nations 1800-2003 scoring 8 or higher on Polity IV scale, a measure of democracy



PLACE: Chicago

© PHOTO: Scanpix / Corbis / Robert Llewellyn

Some Future Predictions

- By 2010, 35 billion devices will be connected to the Internet (nearly six devices per person on the planet).
- By 2015, Google will index approximately 775 billion pages of content.
- By 2015, movie downloads and peer-to-peer file sharing will explode to 100 exabytes, equivalent to 5 million Libraries of Congress.
- By 2015, video calling will be pervasive, generating 400 exabytes of data—the equivalent of 20 million Libraries of Congress.
- By 2015, the phone, web, email, photos, and music will explode to generate 50 exabytes of data.
- By 2020 worldwide, the average person will maintain 130 terabytes of personal data (today it is ~128 gigabytes).
- By 2020, there will be more devices than people online.
- By 2029, 11 petabytes of storage will be available for \$100—equivalent to 600+ years of continuous, 24-hour-per-day, DVD-quality video.
- Within two years, information on the Internet will double every 11 hours.

Thank You!



© Photo: Masterfile / Bill Frymire