

# **Lecture**

## **Internet Trends and Web Basics**

# The Internet and the WWW are Different

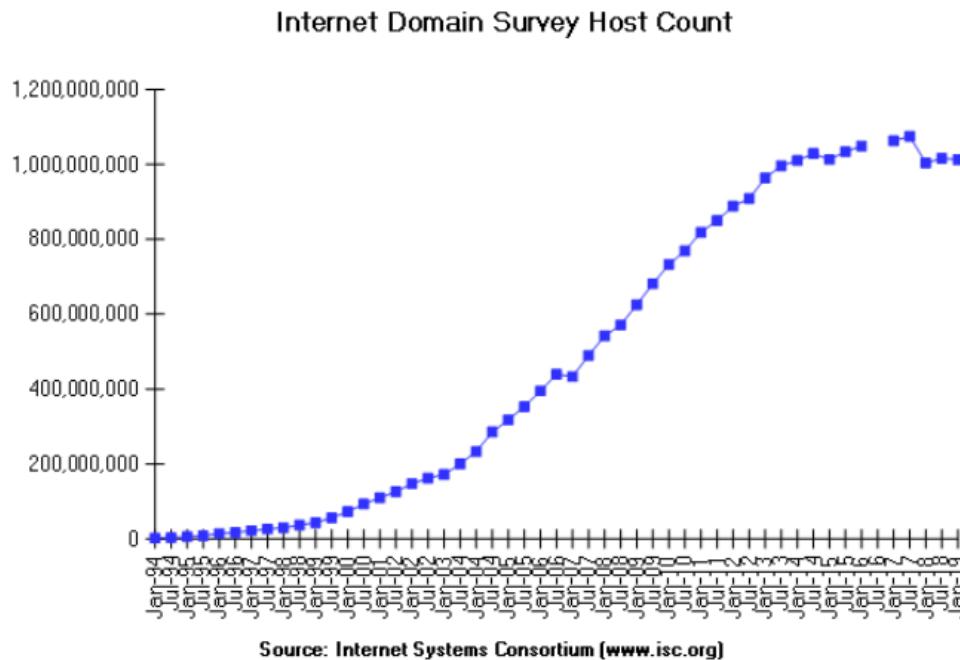
- The *Internet* is a global digital infrastructure that connects hundreds of millions of computers and people
- The *World Wide Web* is a mechanism that unifies the retrieval and display of a subset of data on the Internet
- An *intranet* is a local/global information structure that connects an organization internally. Intranets today often make use of Web technologies
- An *extranet* is a private network that uses the public telecommunication system to securely share part of a business's information or operations with suppliers, vendors, partners, customers, or other businesses.

# **Recent Trends in Internet Development**

- Growth in number of users connected
- Growth in Smartphone use, particularly iOS and Android
- Growth in digital data, especially photos and video
- Growth in Social Media
- Growth in Internet use from Mobile over desktop/laptop
- Growth in tablet usage over desktops/laptops
- Decreased dominance of Microsoft Windows
- Growth in use of the cloud

# How Big is the Internet (historical)

<https://www.isc.org/network/survey>



hosts were doubling every 18 months, but growth has slowed  
See the survey background at: <http://www.isc.org/network/survey>

It counts the number of IP addresses that have been assigned a name. The survey queries the domain name system for the name assigned to every possible IP address. But rather than sending a query to every one of the 4.3 billion possible IP addresses, the survey starts with a list of all network numbers that have been delegated within the IN-ADDR.ARPA domain. **This survey has been discontinued.**

Date	HostCount
Jan 19	1,012,695,272
Jul 18	1,015,787,389
Jan 18	1,003,604,363
Jul 17	1,074,971,748
Jan 17	1,062,660,523
Jan 16	1,048,766,623
Jul 15	1,033,836,245
Jan 15	1,012,706,608
Jul 14	1,028,544,414
Jan 14	1,010,251,829
Jul 13	996,230,757
Jan 13	963,518,598
Jul 12	908,585,739
Jan 12	888,239,420
Jul 11	849,869,781
Jan 11	818,374,269
Jul 10	768,913,036
Jan 10	732,740,444
Jul 09	681,064,561
Jan 09	625,226,456
Jul 08	570,937,778
Jan 08	541,677,360
Jul 07	489,774,269
Jan 07	433,193,199
Jul 06	439,286,364
Jan 06	394,991,609
Jul 05	353,284,187
Jan 05	317,646,084
Jul 04	285,139,107
Jan 04	233,101,481
Jan 03	171,638,297
Jul 02	162,128,493
Jan 02	147,344,723
Jul 01	125,888,197
Jan 01	109,574,429
Jul 00	93,047,785
Jan 00	72,398,092
Jul 99	56,218,000
Jan 99	43,230,000
Jul 98	36,739,000
Jan 98	29,670,000
Jul 97	19,540,000
Jan 97	16,146,000
Jul 96	12,881,000
Jan 96	9,472,000
Jul 95	6,642,000
Jan 95	4,852,000
Jul 94	3,212,000
Jan 94	2,217,000
Jul 93	1,776,000
Jan 93	1,313,000

## Countries with Internet Penetration >45%, 2014

As of 2014 there are 2.8 billion Internet users, with yearly growth at 8%; China and the USA have the largest number of Internet users and the penetration of the population in China remains small

Rank	Country	2014 Internet Users (MM)	2014 Internet User Growth	2013 Internet User Growth	Population Penetration	Total Population (MM)	Per Capita GDP (\$000)
1	China	632	7%	10%	47%	1,356	\$13
2	United States	269	2	2	84	319	\$55
3	Japan	110	0	9	86	127	\$37
4	Brazil	105	4	12	52	203	\$16
5	Russia	87	15	9	61	142	\$25
6	Germany	68	0	1	84	81	\$46
7	United Kingdom	57	4	1	90	64	\$40
8	France	54	-1	5	82	66	\$40
9	Iran (I.R.)	49	8	16	60	81	\$17
10	Egypt	43	15	13	50	87	\$11
11	Korea (Rep.)	42	1	1	85	49	\$35
12	Turkey	38	4	6	46	82	\$20
13	Italy	36	1	2	58	62	\$35
14	Spain	34	0	7	72	48	\$34
15	Canada	30	0	5	86	35	\$45
Top 15		1,653	5%	7%	59%	2,800	
World		2,793	8%	10%	39%	7,176	



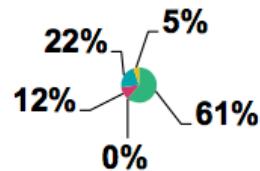
Source: United Nations / International Telecommunications Union, US Census Bureau. Internet user data is as of mid-year. Internet user data for: China from CNNIC, India from IAMAI, Iran from Islamic Republic News Agency, citing data released by the National Internet Development Center, Indonesia from APJII / eMarketer.

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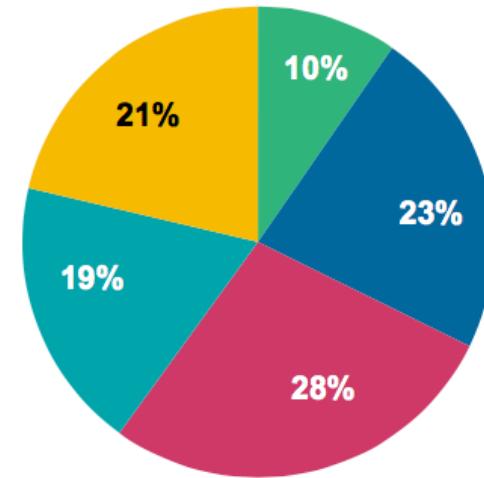
The following slides are based upon a presentation by Mary Meeker of Kleiner Perkins Caufield and Byers, see <http://www.kpcb.com/insights/2014-internet-trends> and <http://www.kpcb.com/insights/2015-internet-trends>, <http://www.kpcb.com/internet-trends>

# Internet Users – 1995 → 2014... <1% to 39% Population Penetration Globally

**1995**  
**35MM+ Internet Users**  
*0.6% Population Penetration*

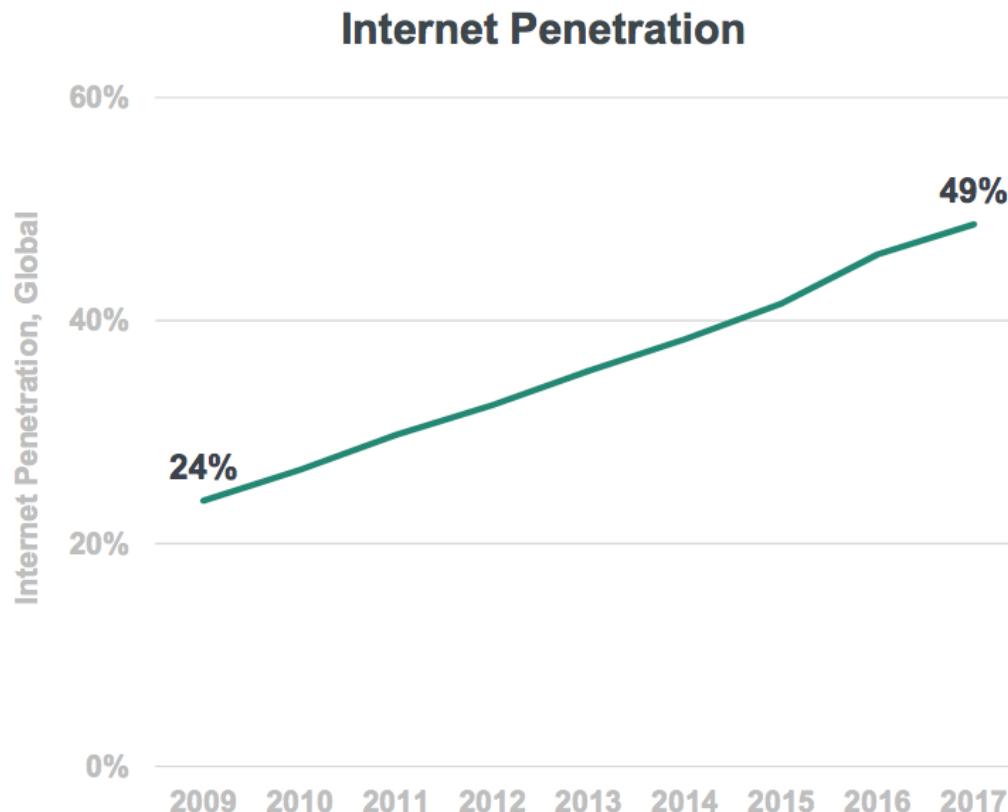


**2014**  
**2.8B Internet Users**  
*39% Population Penetration*



■ USA ■ China ■ Asia (ex. China) ■ Europe ■ Rest of World

# Global Internet Users = 3.6B @ >50% of Population (2018)

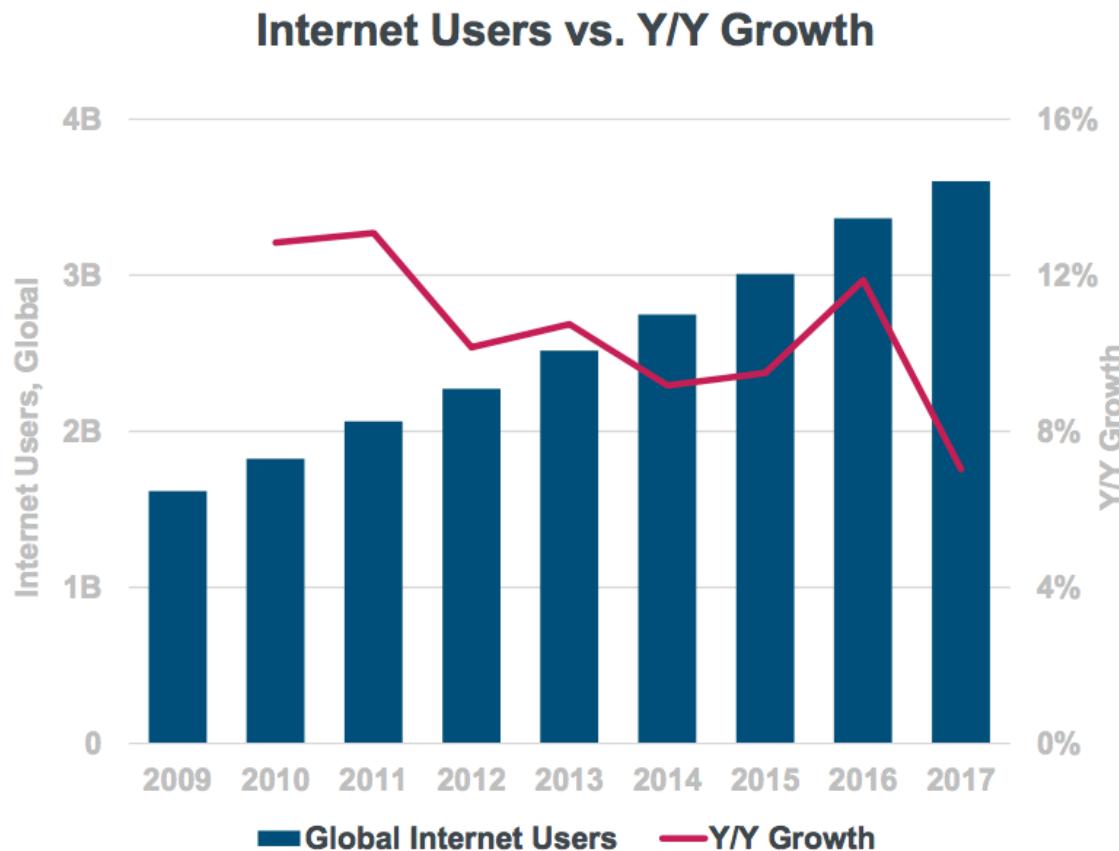


KLEINER PERKINS  
2018  
INTERNET TRENDS

Source: CIA World Factbook, United Nations / International Telecommunications Union, USA Census Bureau. Internet user data is as of mid-year. Internet user data: Pew Research (USA), China Internet Network Information Center (China), Islamic Republic News Agency / InternetWorldStats / KP estimates (Iran), KP estimates based on IAMAI data (India), & APJII (Indonesia). Note: Historical data (particularly in Sub-Saharan Africa) revised by ITU in 2017 to better account for dual-SIM subscriptions (i.e. two Internet subscriptions per single smartphone user).

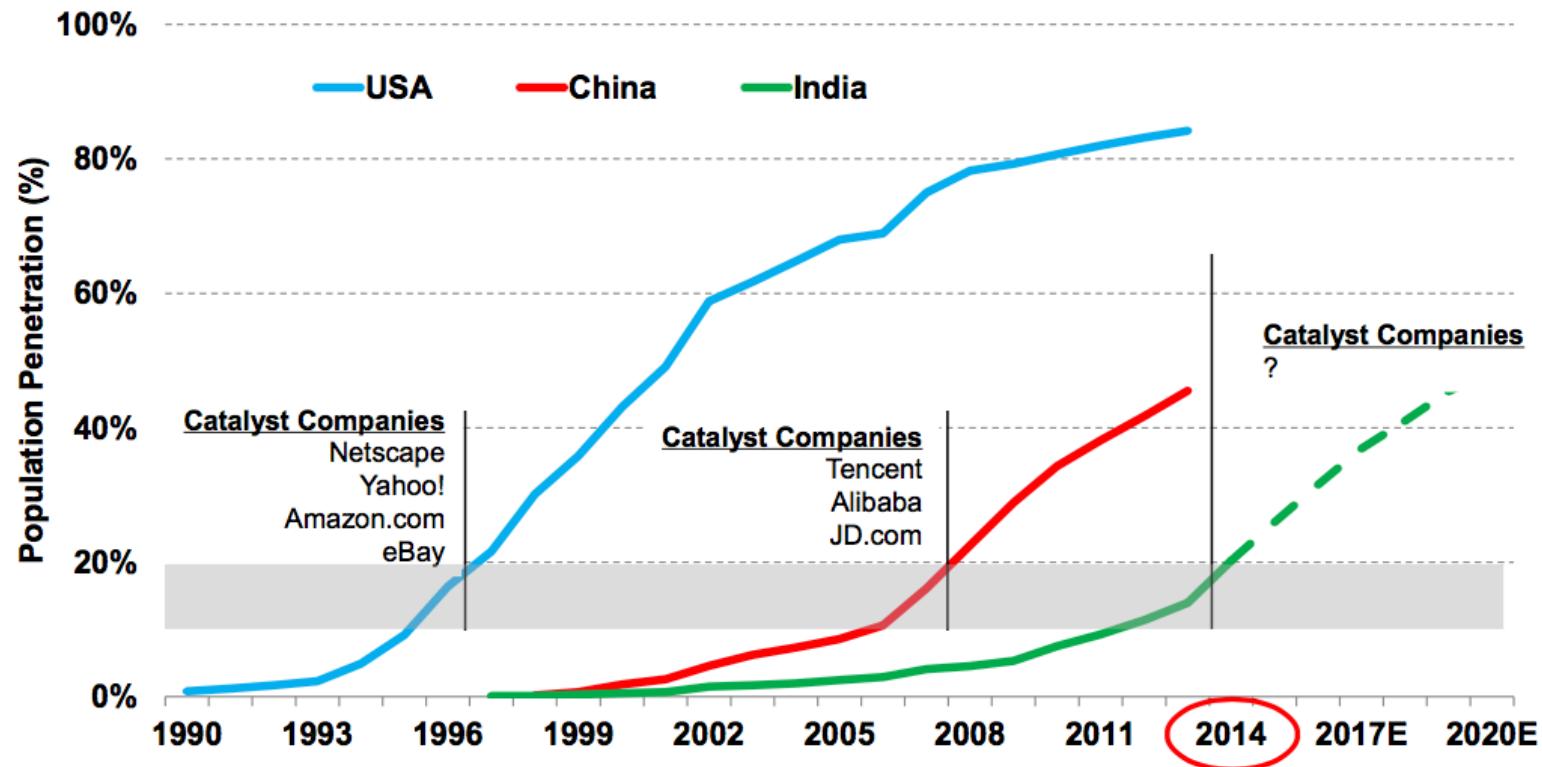
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# Global Internet Users = Slowing Growth @ +7% vs. +12% Y/Y



# India = Appears to Be @ Internet Penetration Growth Inflection

Internet User Penetration Curve, USA / China / India, 1990 – 2020E



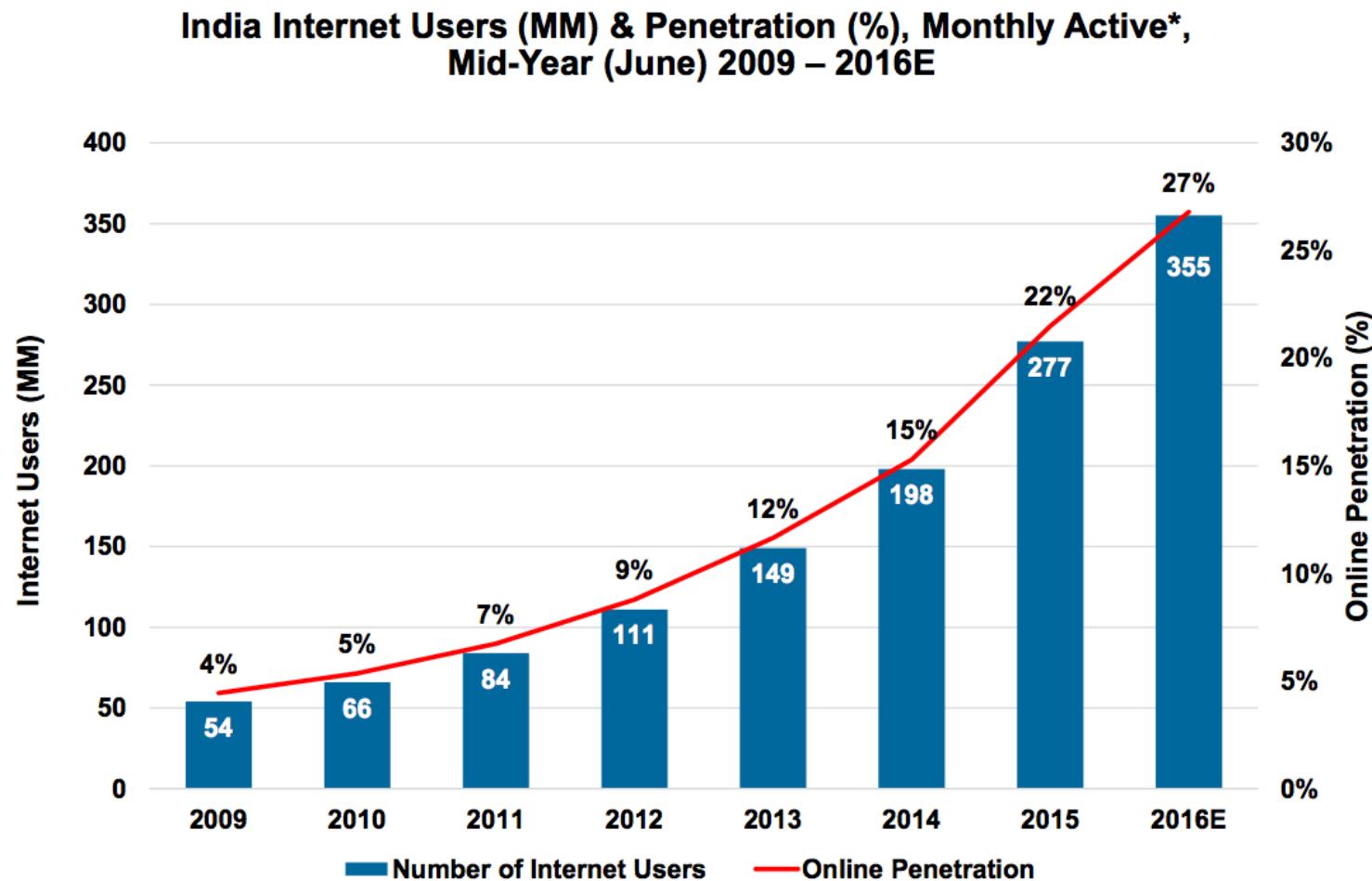
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Source: World Bank, Hillhouse Capital forecast for India beyond 2014.

Hillhouse Capital

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India Internet Users = +28% (2016-June) vs. 40% Y/Y Growth  
 @ 27% Penetration 355MM Users #2 Behind China



KLEINER  
PERKINS

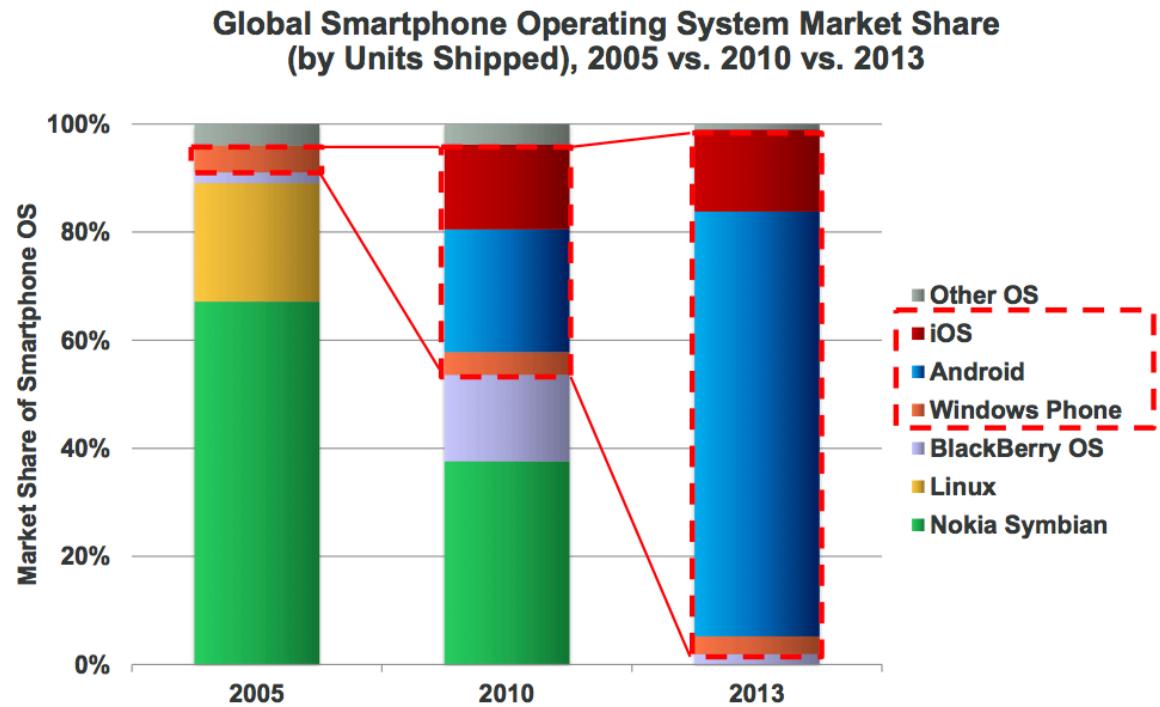
Source: IAMAI, UN Population Division, Worldometer, KPCB estimates based on IAMAI data. Uses mid-year figures.

\*Note that "Monthly Active Users" are distinct from "Ever" users, which IAMAI defines as anyone who has ever accessed the internet. Owing to increasing activity levels, the number of "Monthly Active Users" may grow faster than "Ever" users.

KP INTERNET TRENDS 2017 | PAGE 234

## Global Smartphone Operating Systems 'Made in USA'... 97% Share from 5% Eight Years Ago

Examining smartphone operating systems, over the past seven years, iOS and Android have made major gains with Nokia disappearing and Linux a very small piece of the pie

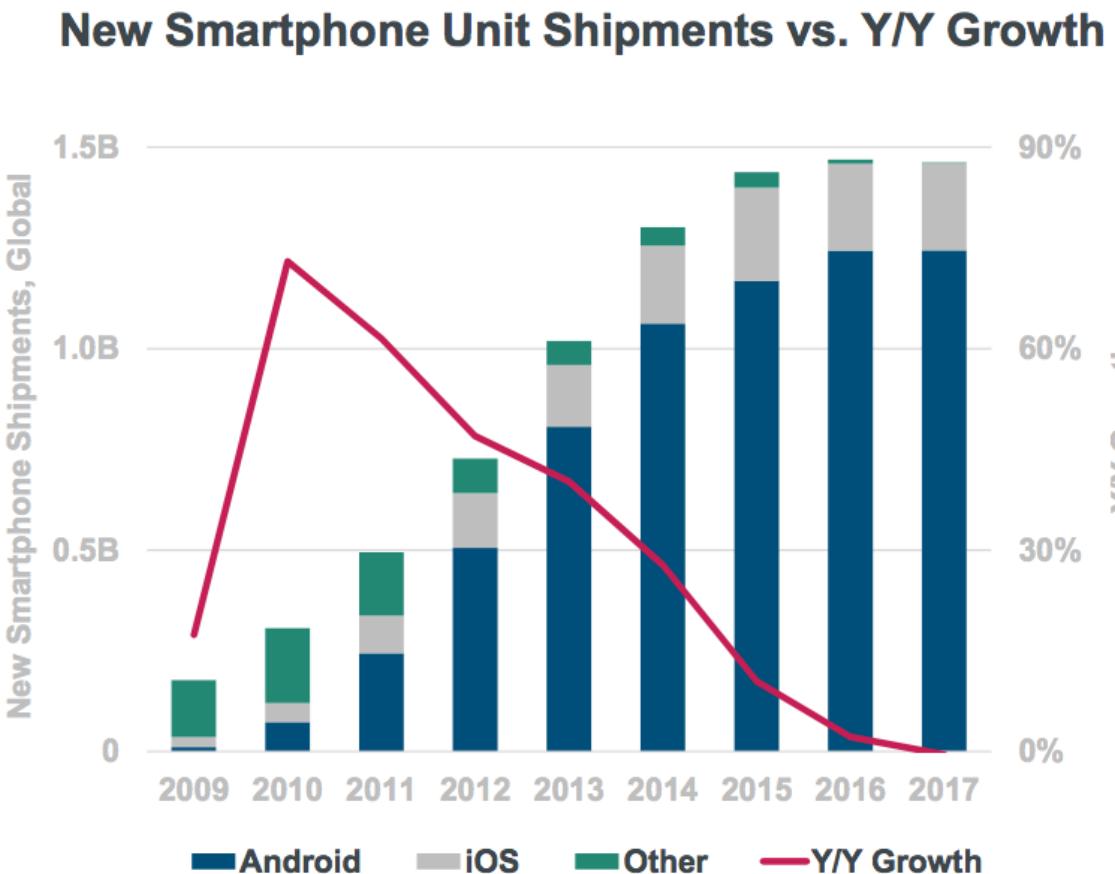


@KPCB

Source: 2005 & 2010 data per Gartner, 2013 data per IDC.

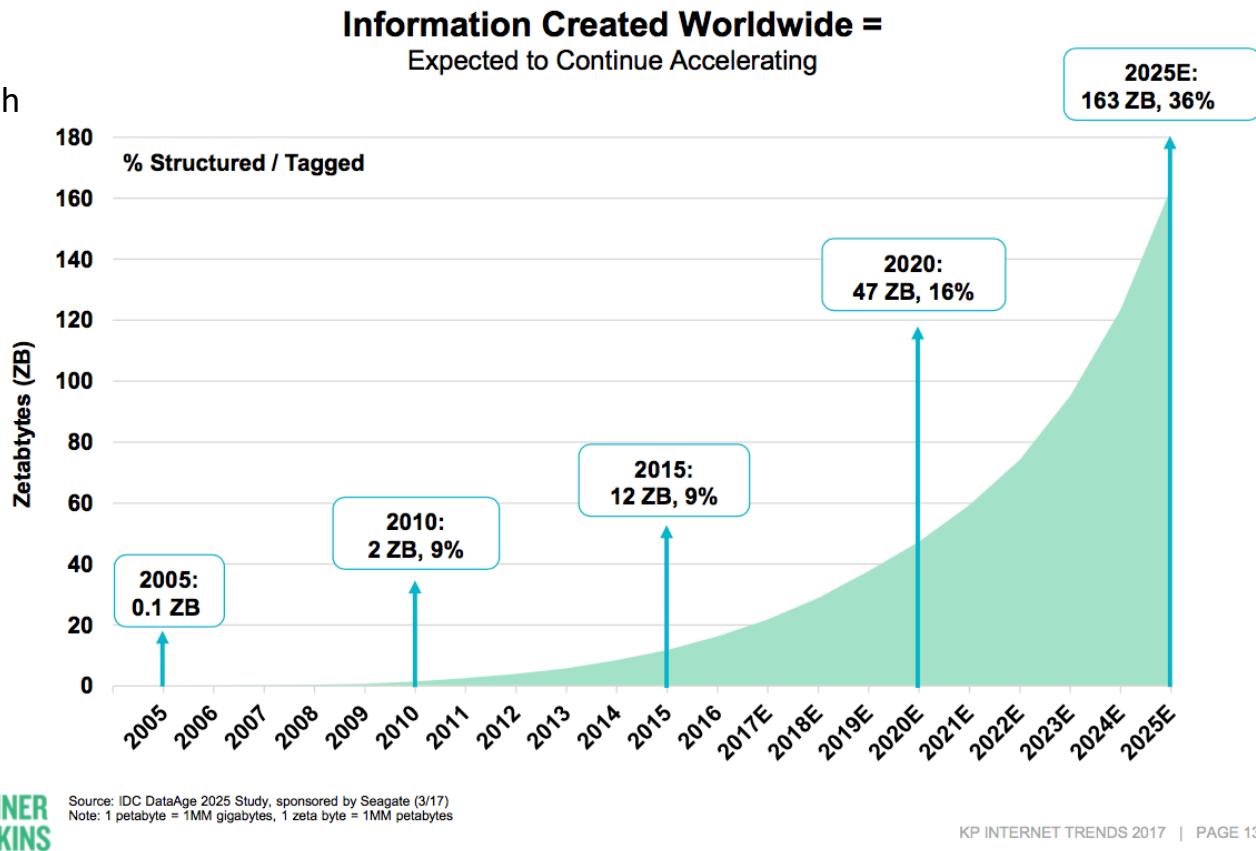
10

# Global New Smartphone Unit Shipments = No Growth @ 0% vs. +2% Y/Y



## Data Volume Growth Continues @ Rapid Clip % Structured / Tagged (~10%) Rising Fast

There has been exponential growth in online information;  
1 Zettabyte = 1,024 Exabytes  
1 Exabyte = 1,024 Petabytes  
1 Petabyte = 1,024 Terabytes  
1 Terabyte = 1,024 Gigabytes  
or  
1 Zettabyte = 1,000,000,000,000 gigabytes

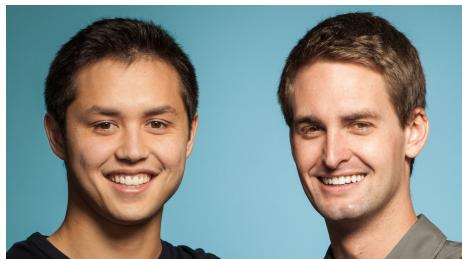


## Photos Alone = 1.8B+ Uploaded & Shared Per Day... Growth Remains Robust as New Real-Time Platforms Emerge

500 million photos are uploaded every day and that number is doubling every year

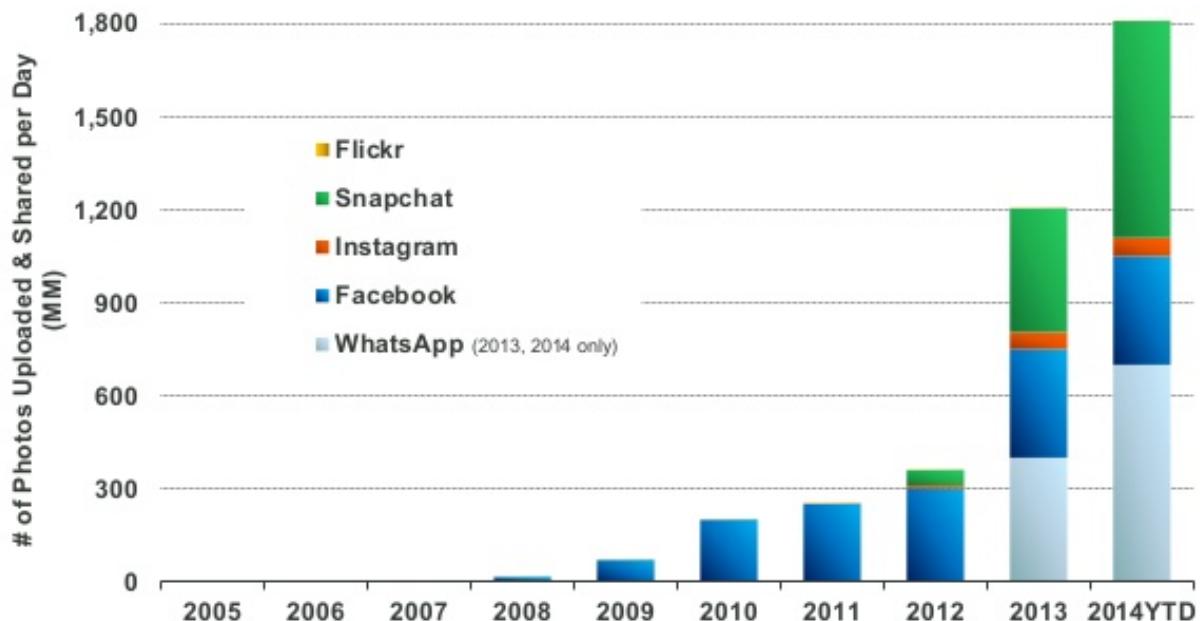
**Instagram** was recently (2010) purchased by Facebook for \$1 billion

**Snapchat** is a photo messaging application developed by two Stanford students (IPO March 2017, \$17B valuation);



bobby Murphy - Evan Spiegel

Daily Number of Photos Uploaded & Shared on Select Platforms,  
2005 – 2014YTD



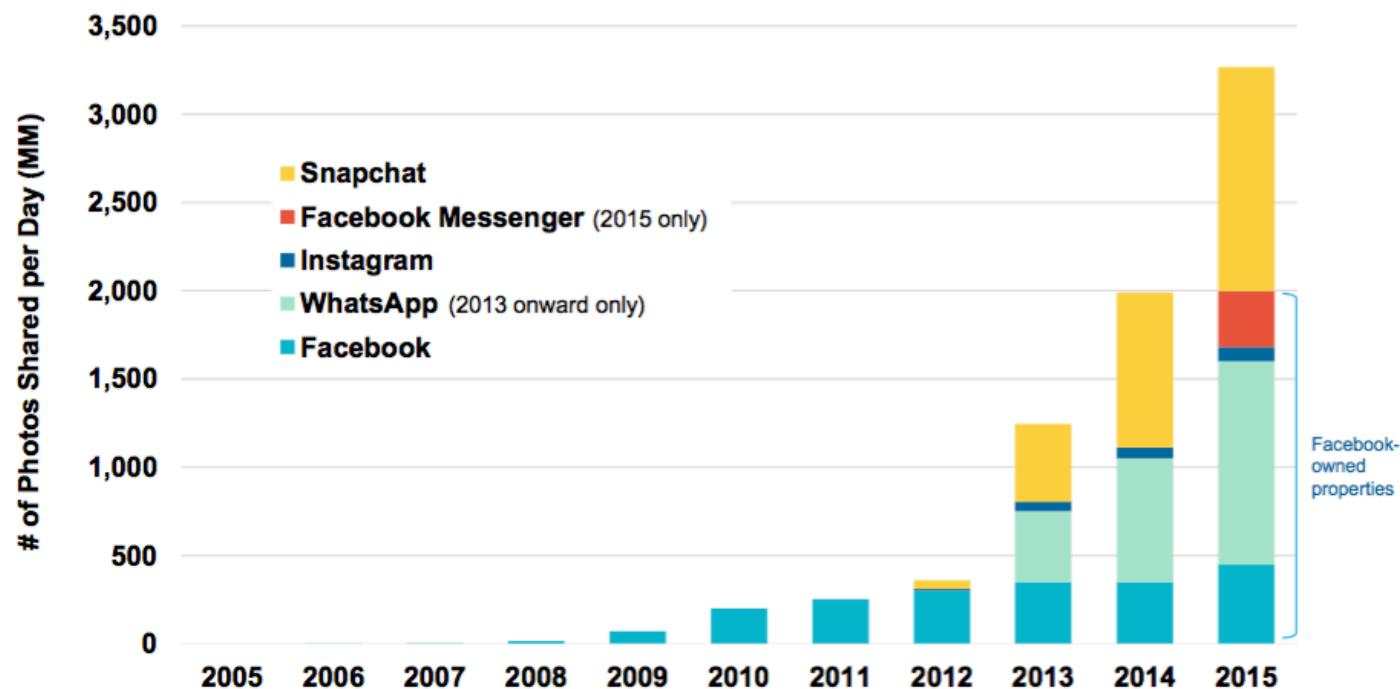
Source: KPCB estimates based on publicly disclosed company data. 2014 YTD data per latest as of 5/14.

@KPCB

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# Image Growth Remains Strong

## Daily Number of Photos Shared on Select Platforms, Global, 2005 – 2015



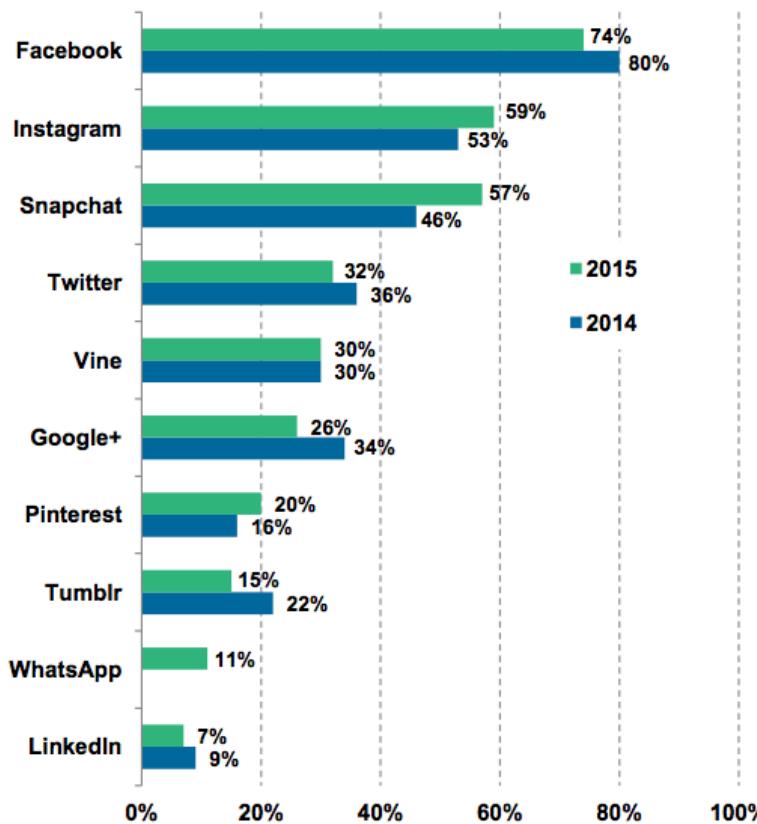
Source: Snapchat, Company disclosed information, KPCB estimates

Note: Snapchat data includes images and video. Snapchat stories are a compilation of images and video. WhatsApp data estimated based on average of photos shared disclosed in Q1:15 and Q1:16. Instagram data per Instagram press release. Messenger data per Facebook (~9.5B photos per month). Facebook shares ~2B photos per day across Facebook, Instagram, Messenger, and WhatsApp (2015).

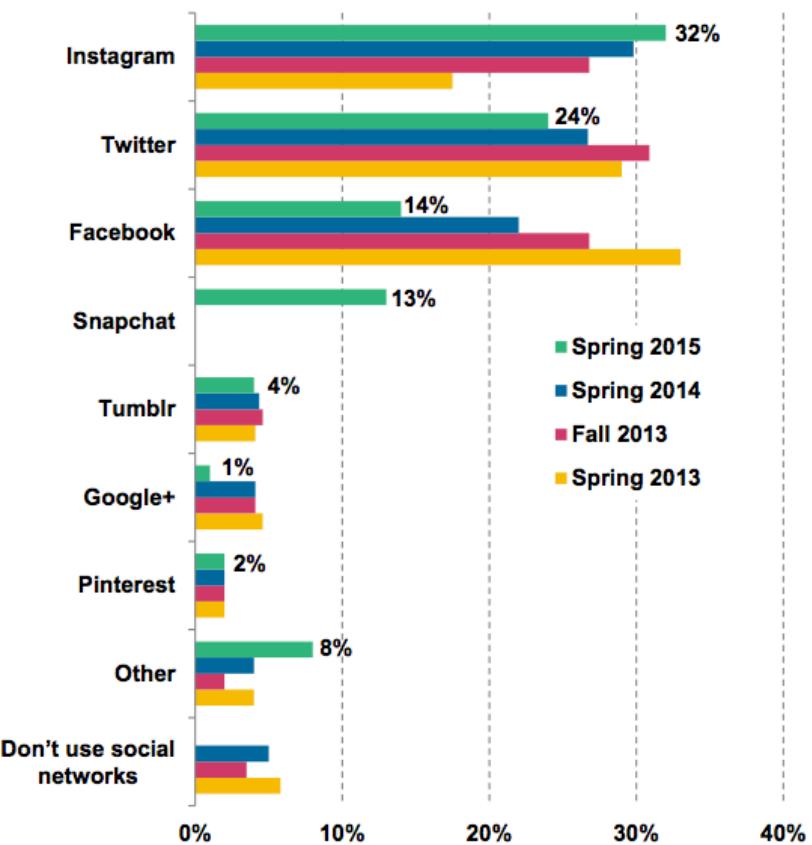
KPCB INTERNET TRENDS 2016 | PAGE 90

# 12-24 Year Olds Internet Usage = Visual Stuff (In & Out) Rules... Instagram + Snapchat + Pinterest = Continue to Rise

**Social Media Usage Among American Youth  
(Age 12-24)<sup>1</sup>, USA, 3/15**



**Teens' Most Important Social Network<sup>2</sup>, USA, 4/15**



@KPCB

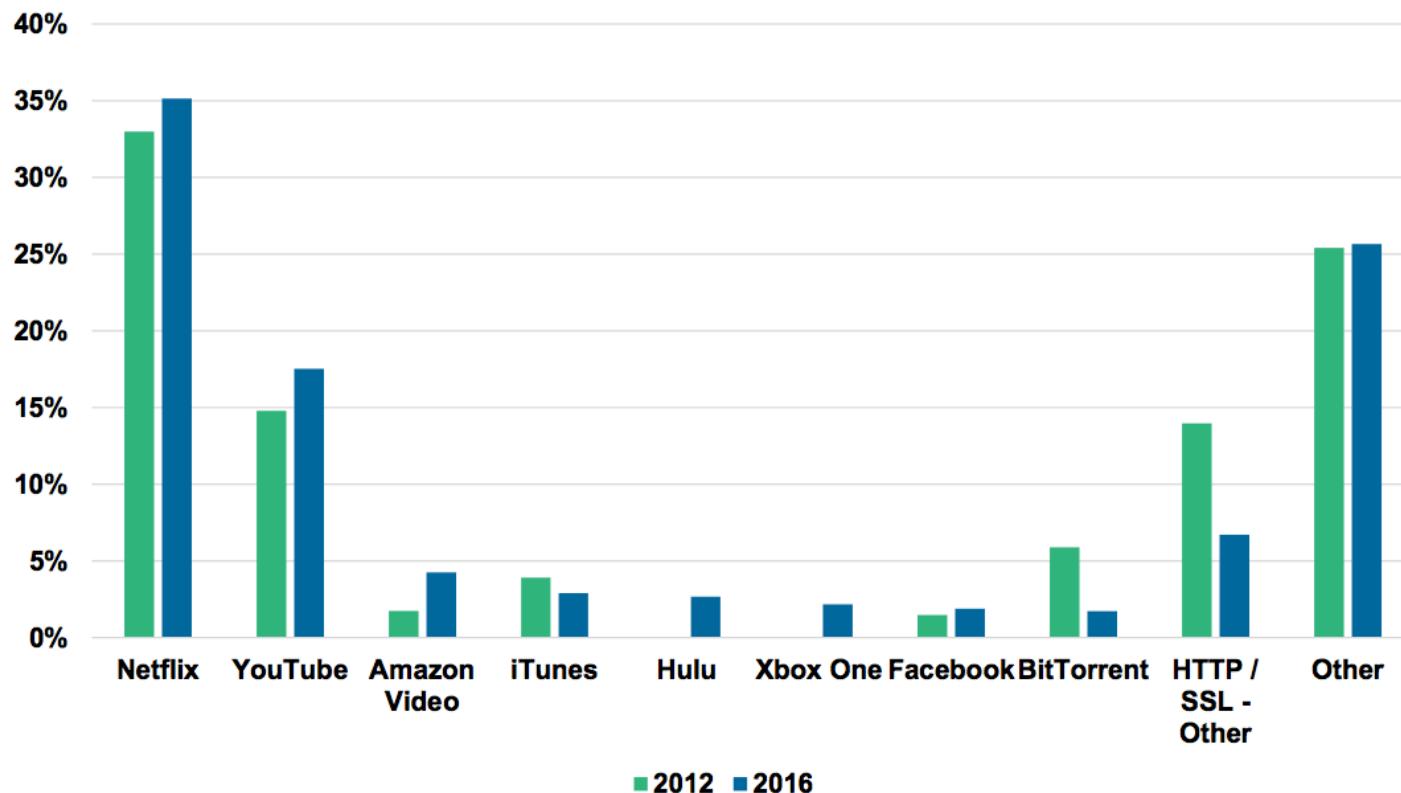
Source: Edison Research / Triton Digital, Piper Jaffray.

Note: (1) 12-24 year olds who currently ever use social networking sites/services. (2) Based on survey of US teens with an average age of 16.3 years.

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## Netflix / YouTube = Fixed-Access Video Traffic Share Leaders

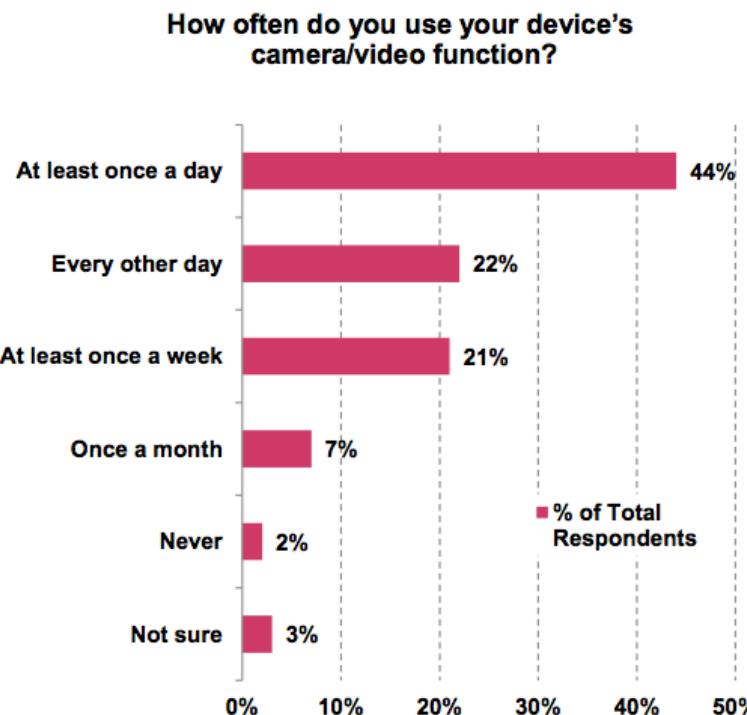
Share of Downstream Video Traffic (%), North America, 2H 2016



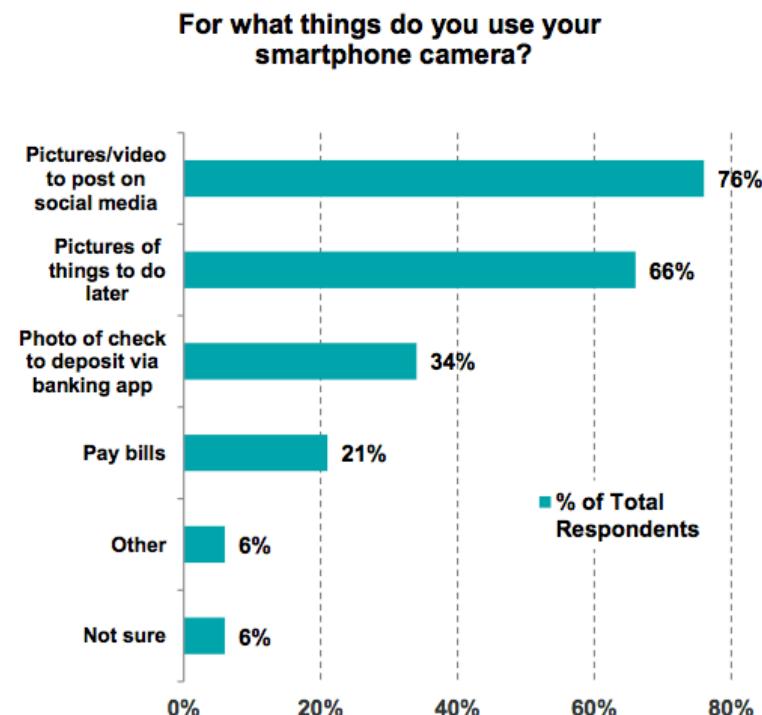
# Millennials Love Their Smartphone Cameras...

## 44% Use Camera / Video Function Daily...76% Post on Social Media

**Millennial Smartphone Camera Usage\*,  
USA, 2014**



**Millennial Smartphone Camera Use Cases,  
USA, 2014**



Source: Zogby Analytics.

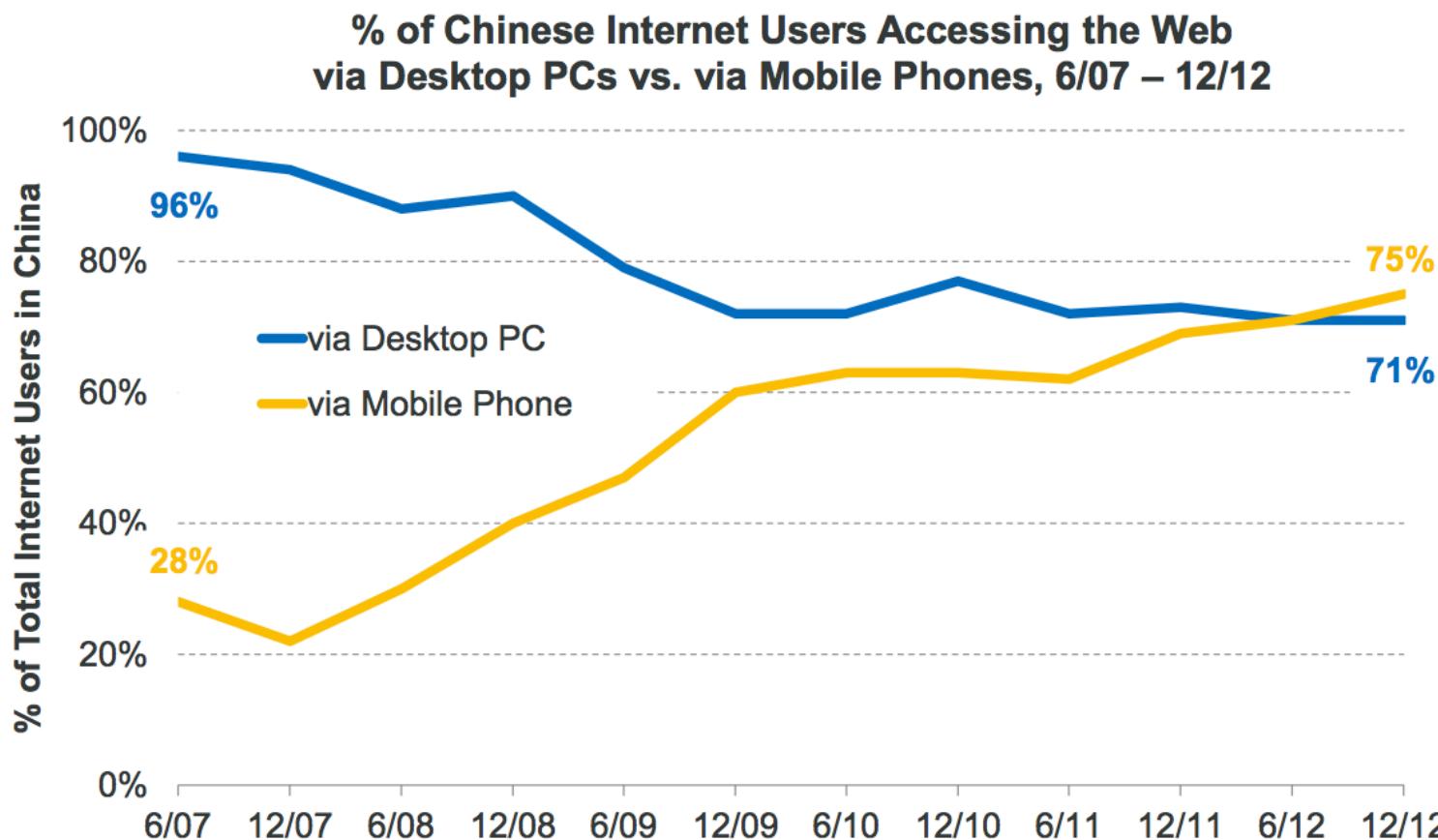
\*18-24 year olds.

Note: Zogby Analytics was commissioned by Mitek Systems, Inc. to conduct an online survey of 1,019 millennials who have a smartphone. For the purposes of this survey, "millennials" are defined as adults between the ages of 18-34. All interviews were completed May 30 through June 6, 2014.



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## China – Mobile Internet Access Surpassed PC, Q2:12

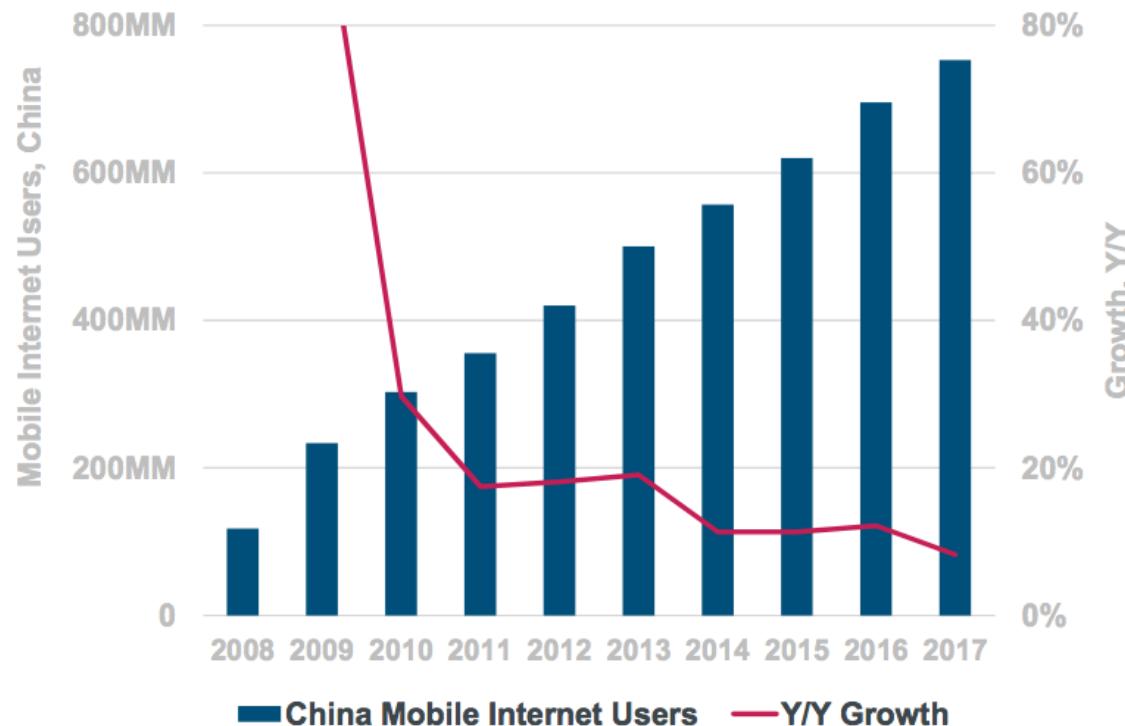


Source: CNNIC, 1/13. 33

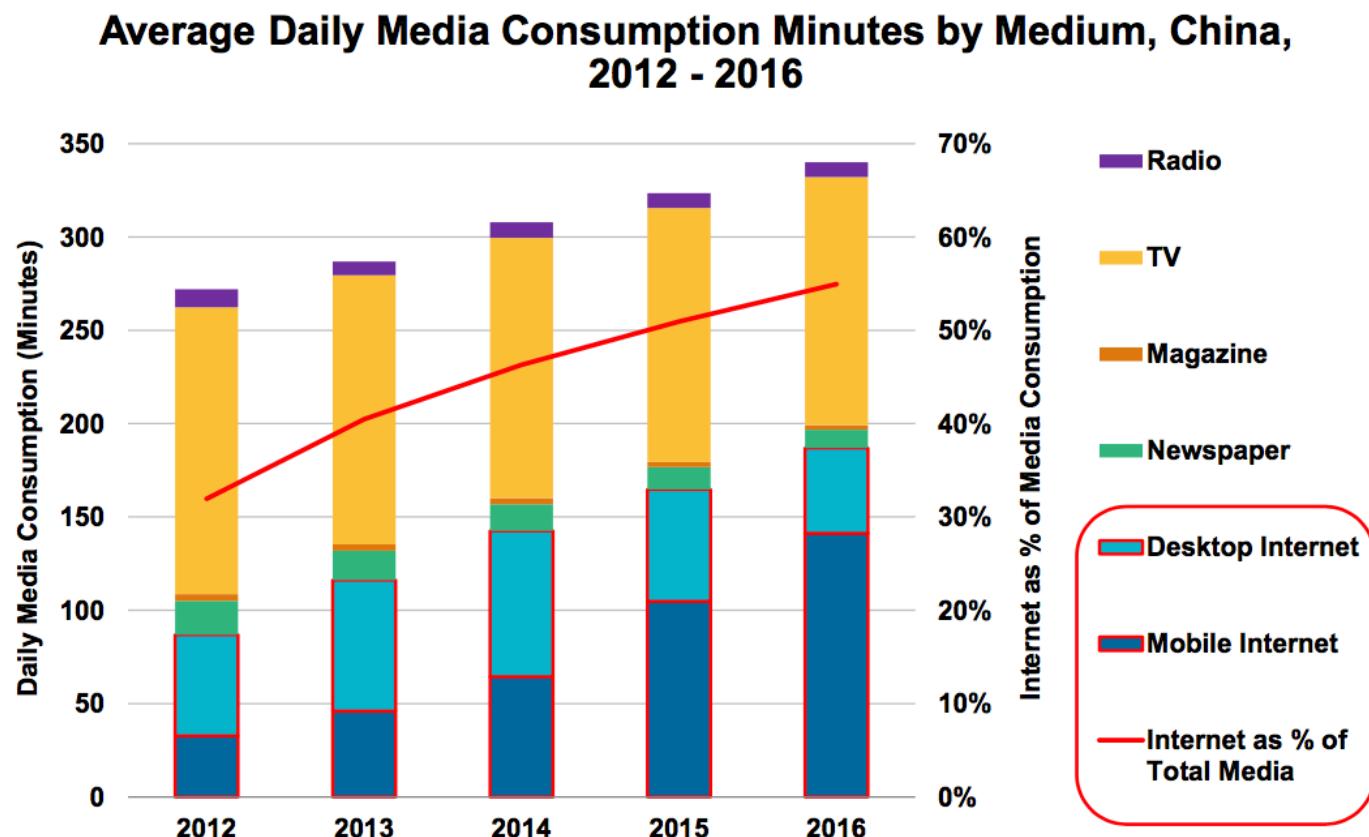
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**China Mobile Internet Users =  
753MM...+8% vs. 12% Y/Y**

### **China Mobile Internet Users vs. Y/Y Growth**



# China Media = Internet @ 55% of Time Spent   Mobile > TV (2016)



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Source: Zenith Optimedia



Hillhouse  
Capital

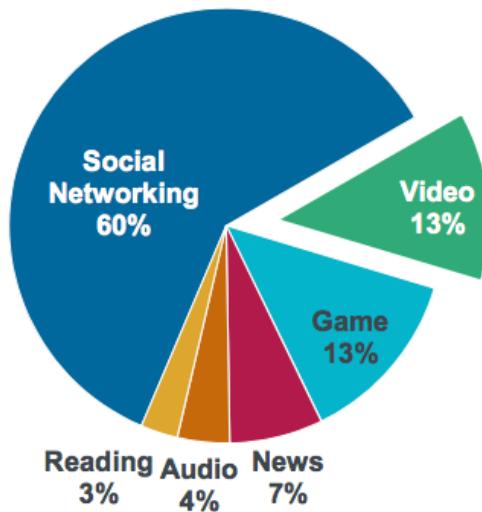
KP INTERNET TRENDS 2017 | PAGE 203

# China Mobile Media / Entertainment Time Spent = +22% Y/Y...Mobile Video Growing Fastest

## China Mobile Media / Entertainment Daily Time Spent

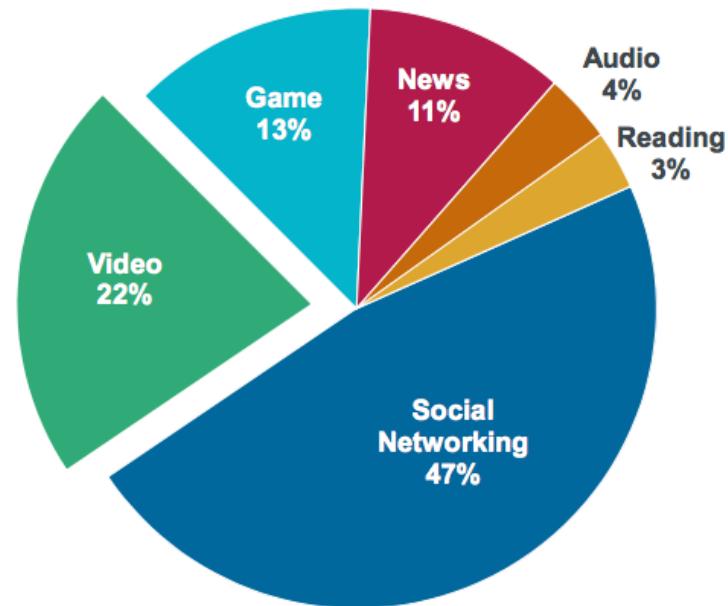
March 2016

2.0B Hours



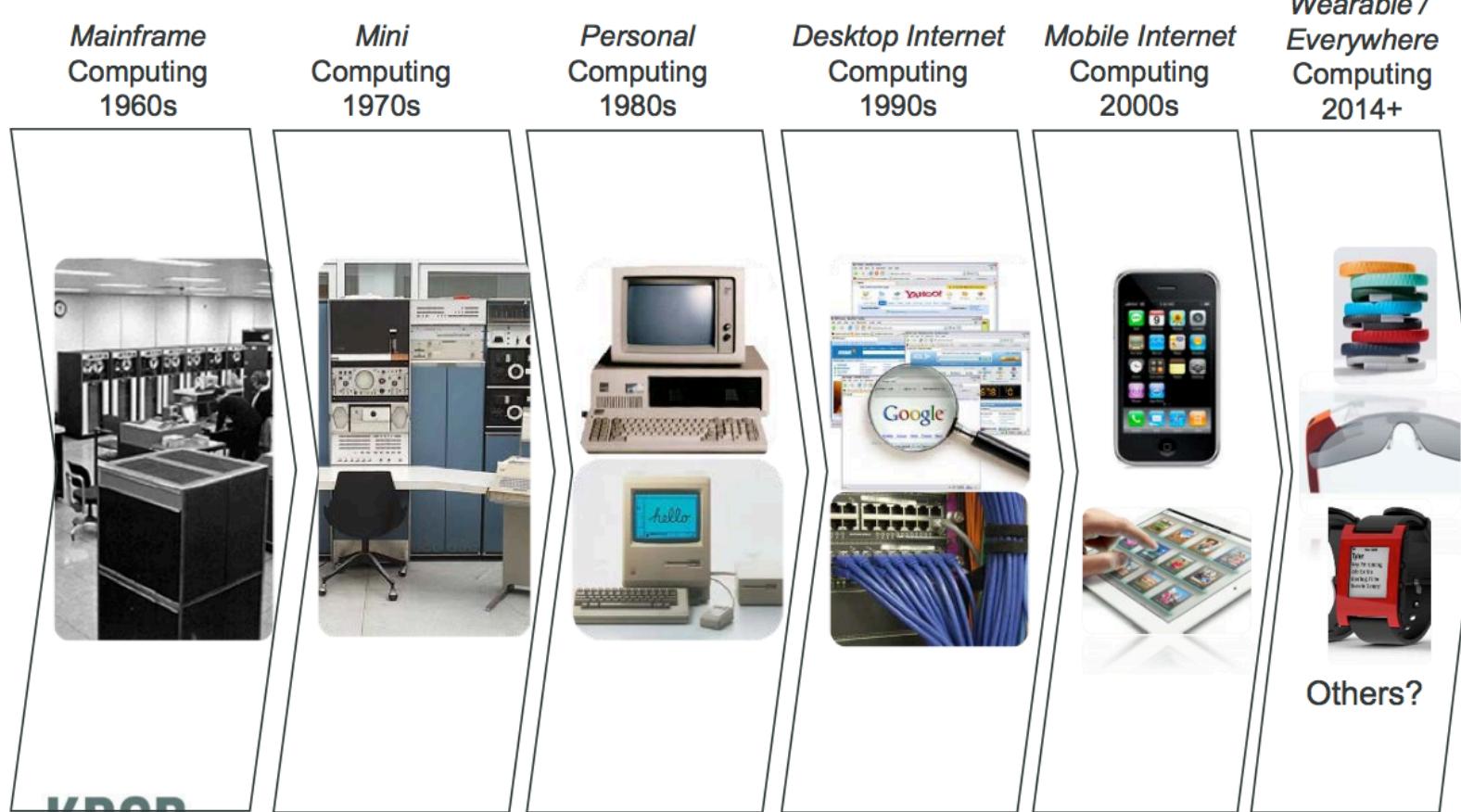
March 2018

3.2B Hours, +22% Y/Y



## Technology Cycles – Still Early Cycle on Smartphones + Tablets, Now Wearables Coming on Strong, Faster than Typical 10-Year Cycle

### Technology Cycles Have Tended to Last Ten Years



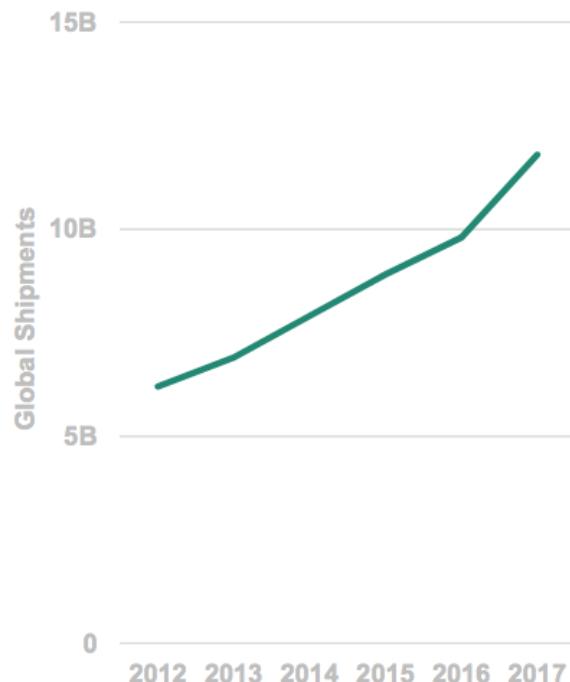
KPCB

Image Source: Computersciencelab.com, Wikipedia, IBM, Apple, Google, NTT docomo, Google, Jawbone, Pebble.

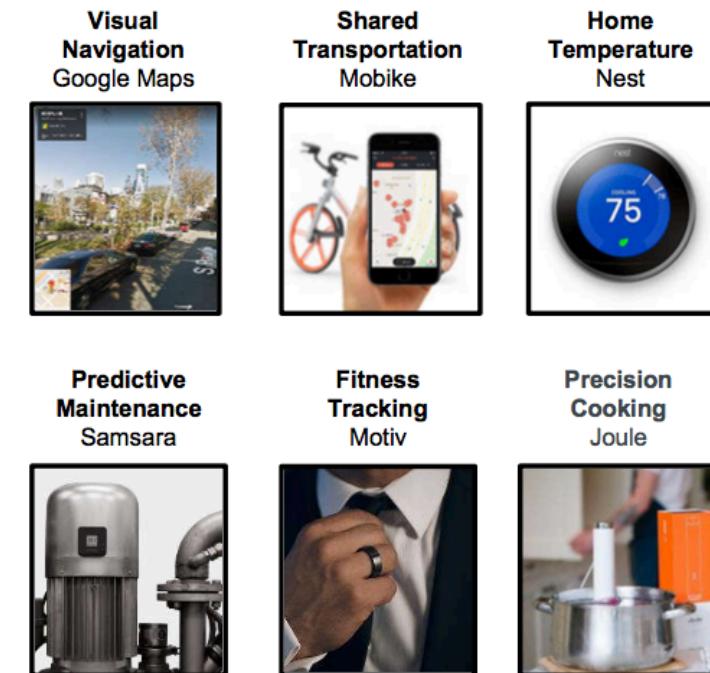
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# ...Data Gathering + Sharing + Optimization (2006 →) = Enabled by Sensor Pervasiveness...

## MEMS Sensor / Actuator Shipments

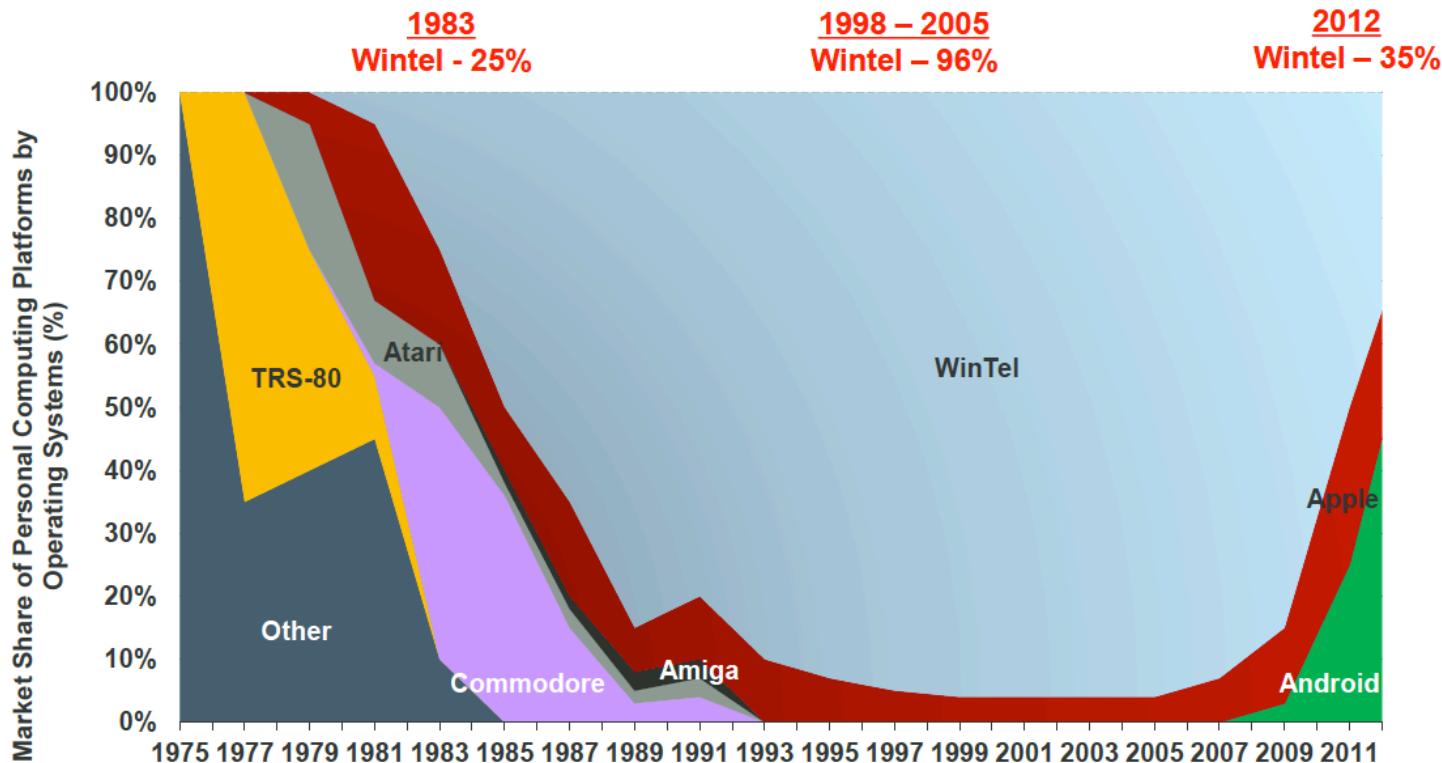


## Sensors + Data = In More Places



# Re-Imagination of Computing Operating Systems - iOS + Android = 60% Share vs. 35% for Windows

Global Market Share of Personal Computing Platforms by Operating System Shipments, 1975 – 2012



KPCB

Source: Asymco.com (as of 2011), Public Filings, Morgan Stanley Research, Gartner for 2012 data.

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# ...While The Cloud Rises

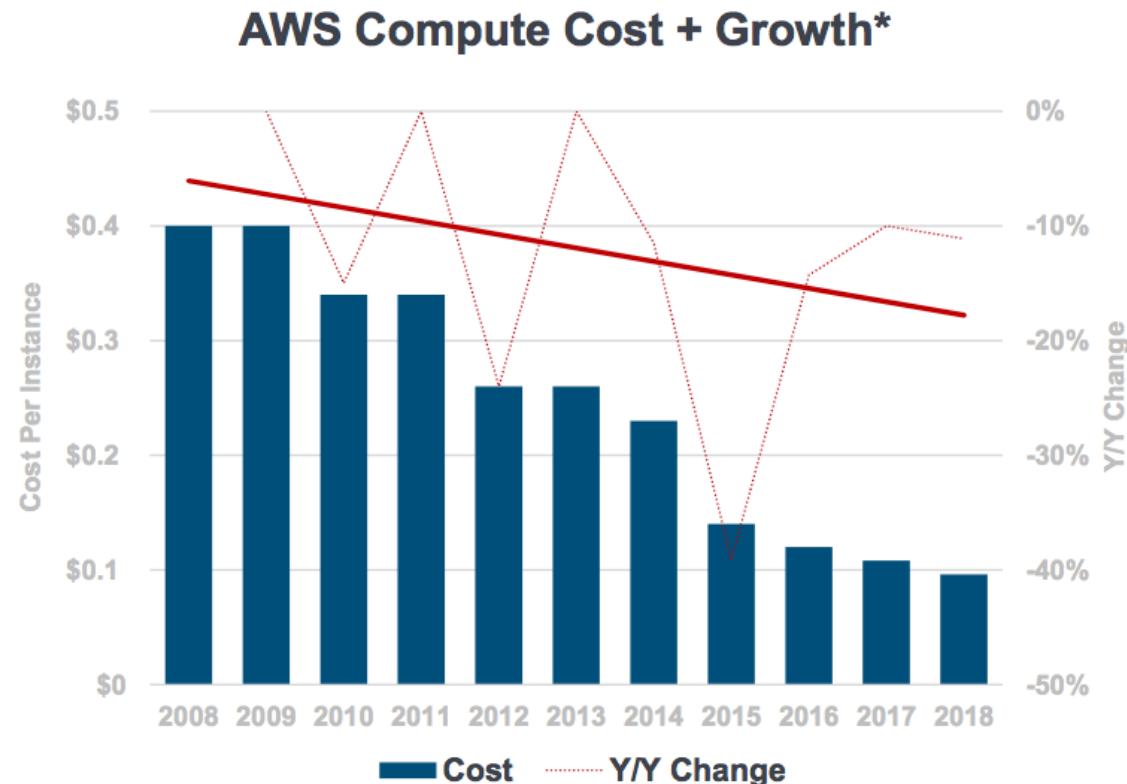
*Amazon Web Services (AWS) Leading Cloud Charge...*



\*Note: S3 is AWS' storage product and used as proxy for AWS scale / growth .  
Source: Company data.

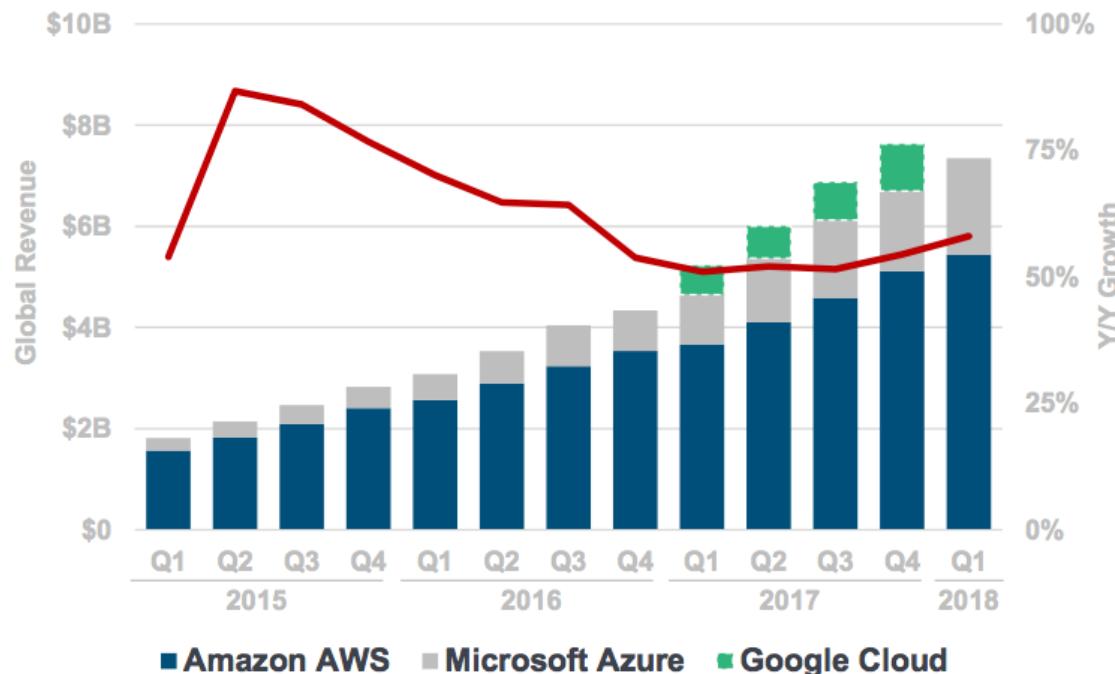
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# ...Computing Big Bangs Volume Effects = Cloud Compute Cost Declines Continue -11% vs. -10% Y/Y...

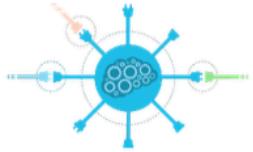


# ...Computing Big Bangs Volume Effects = Cloud Revenue Re-Accelerating +58% vs. +54% Q/Q

## Cloud Service Revenue – Amazon + Microsoft + Google



# Cloud Evolution / Tools = Paving Way for Innovation Across Infrastructure Landscape



## New Methods of Software Delivery =

APIs / Browser Extensions creating new wave of capabilities (+ companies) for both companies and end users



## Containers / Microservices =

Simplify software development process / improve consistency between testing & production environments / reduce complexity of managing & updating apps due to modular approach



## Elastic Analytical Databases =

Likes of Google BigQuery / Snowflake / AWS Redshift Spectrum nearly infinitely scalable / usage based + have minimal maintenance requirements

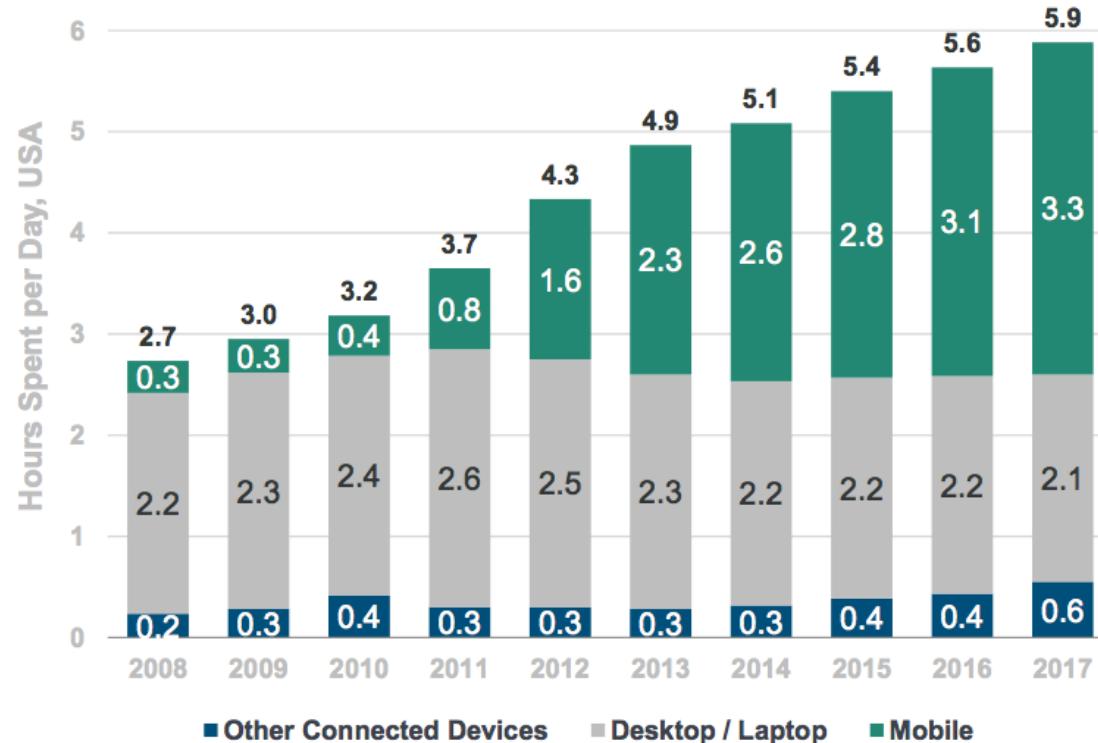


## Edge Computing =

Pushing compute away from centralized nodes & closer to sources of data addresses many IT challenges when running data-centric workloads in cloud – reduces latency / can have security + compliance benefits

# Digital Media Usage @ +4% Growth... 5.9 Hours per Day (Not Deduped)

## Daily Hours Spent with Digital Media per Adult User



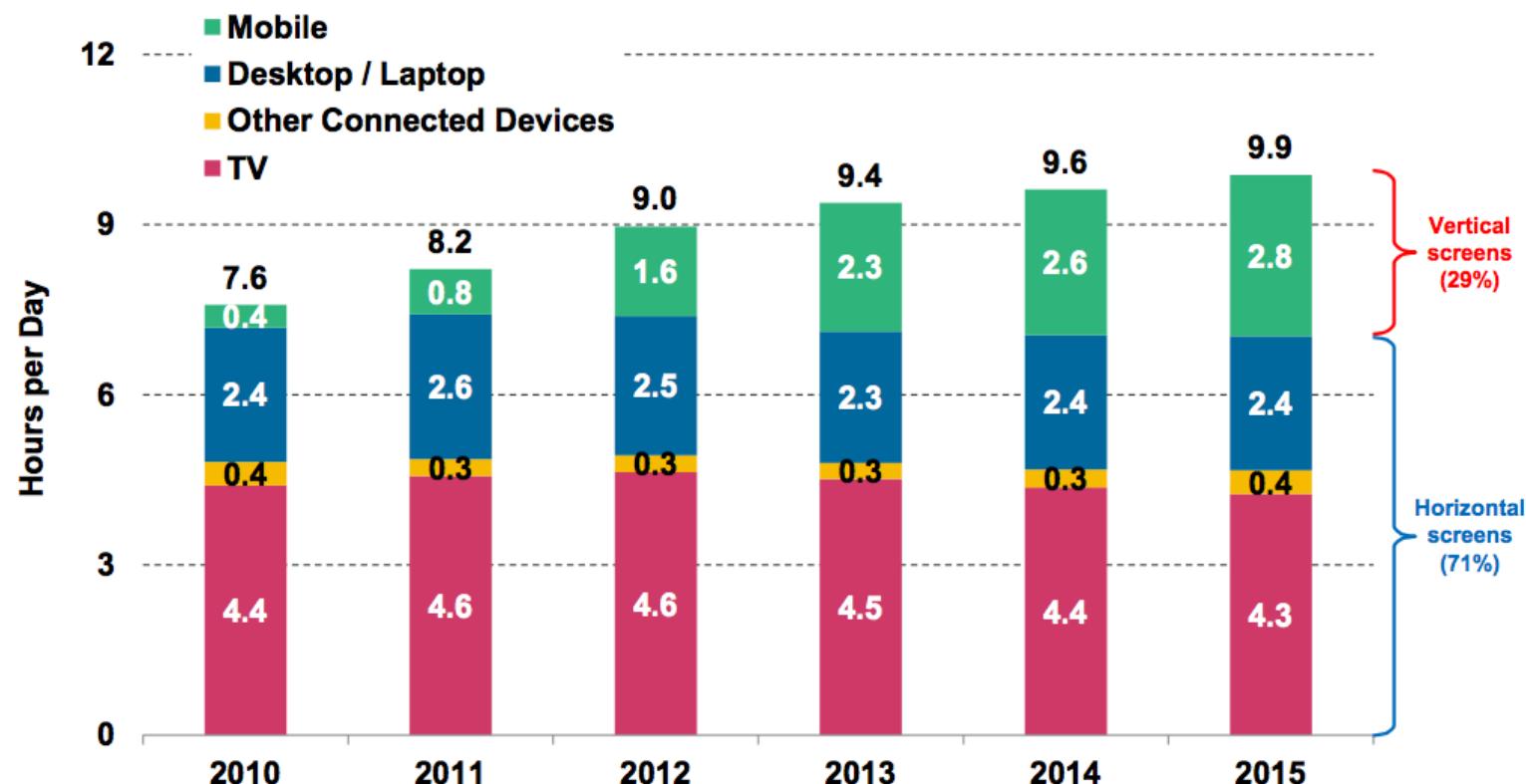
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2018  
INTERNET TRENDS

Source: eMarketer 9/14 (2008-2010), eMarketer 4/15 (2011-2013), eMarketer 4/17 (2014-2016), eMarketer 10/17 (2017). Note: Other connected devices include OTT and game consoles. Mobile includes smartphone and tablet. Usage includes both home and work for consumers 18+. Non deduped defined as time spent with each medium individually, regardless of multitasking.

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...Vertical Viewing =  
29% of View Time (Multi-Platform) vs. 5% Five Years Ago, USA...

Time Spent on Screens by Orientation (Hours / Day), USA, 2010 – 2015



@KPCB

Source: eMarketer 4/15, Coacute analysis. Note: Other connected devices include OTT and game consoles. Mobile includes smartphone and tablet. Usage includes both home and work. Ages 18+; time spent with each medium includes all time spent with that medium, regardless of multitasking; for example, 1 hour of multitasking on desktop/laptop while watching TV is counted as 1 hour for TV and 1 hour for desktop/laptop.

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# Messaging Apps = Top Global Apps in Usage + Sessions

**6+ of Top 10  
most used apps  
globally =  
Messaging Apps**

Top Apps by Usage

Rank	App	
①		Facebook
②		WhatsApp
③		Messenger
④		Instagram
⑤		LINE
⑥		Viber
⑦		KakaoTalk
⑧		Clash of Clans
⑨		WeChat
⑩		Twitter

Top Apps By Number of Sessions

Rank	App	Sessions	
①		KakaoTalk	55
②		WhatsApp	37
③		WeChat	29
④		VK	29
⑤		LINE	26
⑥		Viber	20
⑦		Facebook	20
⑧		Clash of Clans	16
⑨		Instagram	12
⑩		Messenger	8

Messaging  
Apps →  
significant app  
sessions

# Messaging = Extensibility Expanding

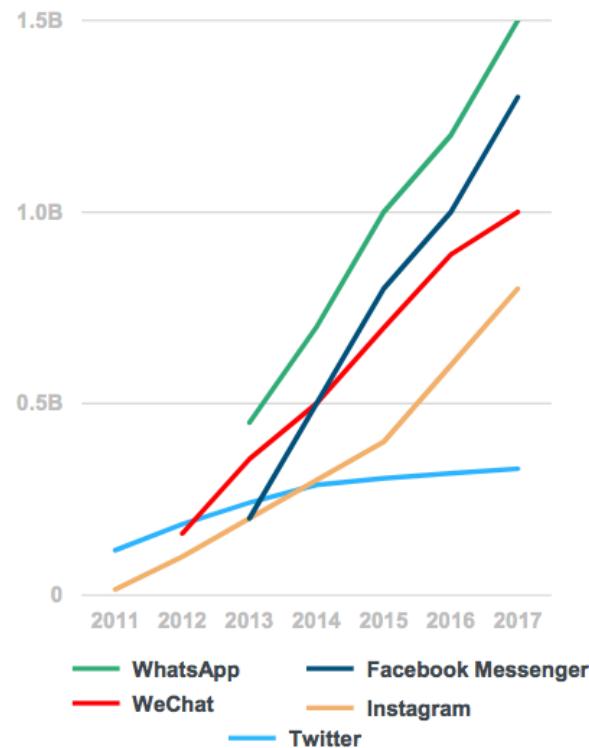
**Messaging**  
Tencent (2000 → 2018)



I am on WeChat: marcopapa99

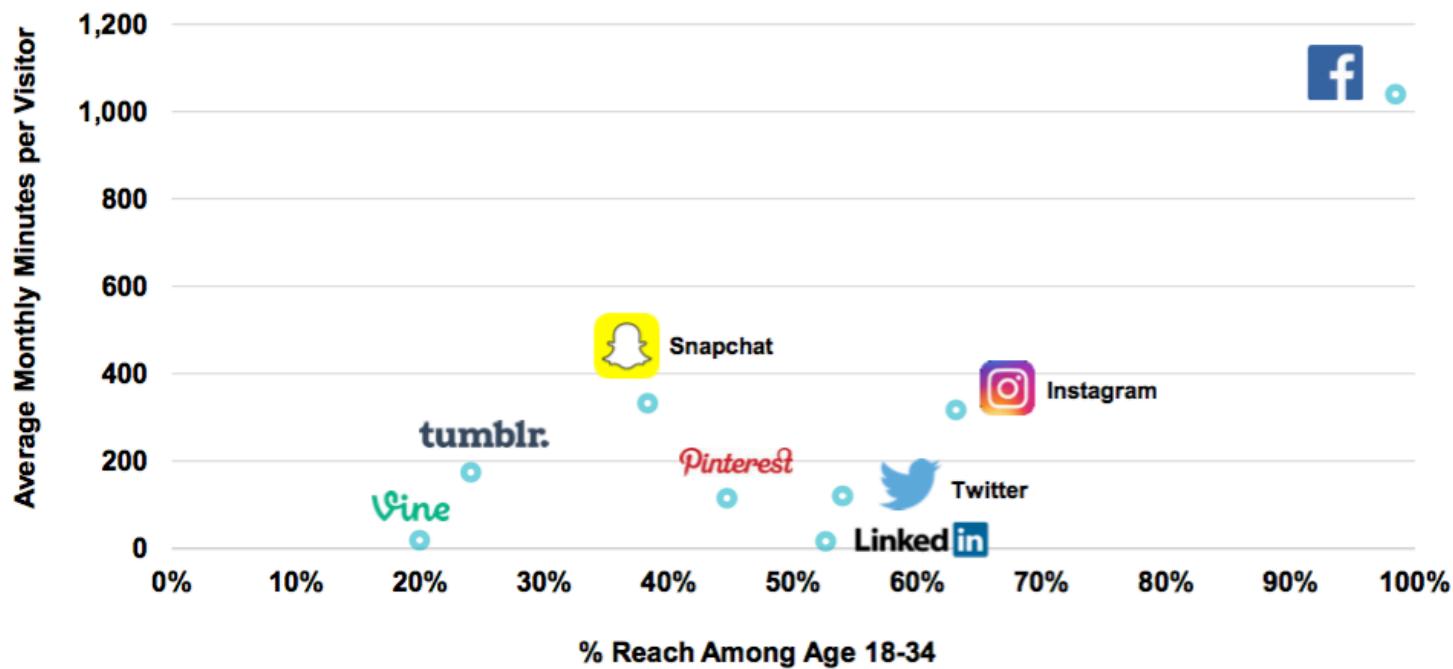
## Messenger MAUs

MAU = Monthly Active Users



# Millennial Social Network Engagement Leaders = Visual... Facebook / Snapchat / Instagram...

Age 18-34 Digital Audience Penetration vs.  
Engagement of Leading Social Networks, USA, 12/15



# Asia-Based Messaging Leaders = Continue to Expand Uses / Services Beyond Social Messaging

New Services Added 2015 -16\*

Previous Existing Services



Name	KakaoTalk	WeChat	LINE
Launch	March 2010	January 2011	June 2011
Primary Country	Korea	China	Japan
Banking / Financial Services	Kakao Bank (11/15)	WeBank (1/15)	Debit Card (2016)
Enterprise	x	Enterprise WeChat (3/16)	x
Online-To-Offline (O2O)	Kakao Hairshop (1H:16E) Kakao Driver (1H:16E)	✓	Grocery Delivery (2015)
TV	Kakao TV (6/15)	✓	Line Live & Line TV (2015)
Video Calls / Chat	(6/15)	✓	✓
Taxi Services	Kakao Taxi (3/15)	✓	✓
Messaging	✓	✓	✓
Group Messaging	✓	✓	✓
Voice Calls	Free VoIP calls (2012)	WeChat Phonebook (2014)	✓
Payments	KakaoPay (2014)	(2013)	Line Pay (2014)
Stickers	(2012)	Sticker shop (2013)	(2011)
Games	Game Center (2012)	(2014)	(2011)
Commerce	Kakao Page (2013)	Delivery support w / Yixin (2013)	Line Mall (2013)
Media	Kakao Topic (2014)	✓	✓
QR Codes	✓	QR code identity (2012)	✓
User Stories / Moments	Kakao Story (2012)	WeChat Moments	Line Home (2012)
Developer Platform	KakaoDevelopers	WeChat API	Line Partner (2012)

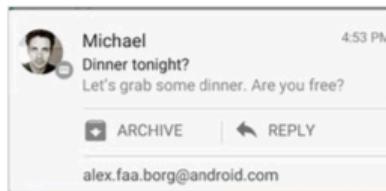
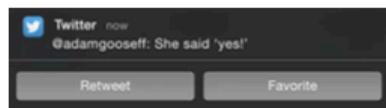
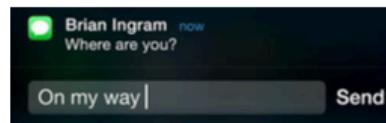
# Average Global Mobile User = ~33 Apps...12 Apps Used Daily... 80% of Time Spent in 3 Apps

## Day in Life of a Mobile User, 2016

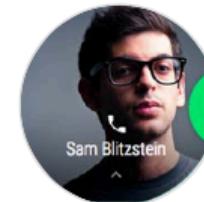
	Average # Apps Installed on Device*	Average Number of Apps Used Daily	Average Number of Apps Accounting for 80%+ of App Usage	Time Spent on Phone (per Day)	Most Commonly Used Apps
<b>USA</b>	37	12	3	5 Hours	Facebook Chrome YouTube
<b>Worldwide</b>	33	12	3	4 Hours	Facebook WhatsApp Chrome

# Notifications = Growing Rapidly & Increasingly Interactive... Driving New Touch Points with Messaging Platforms + Other Apps

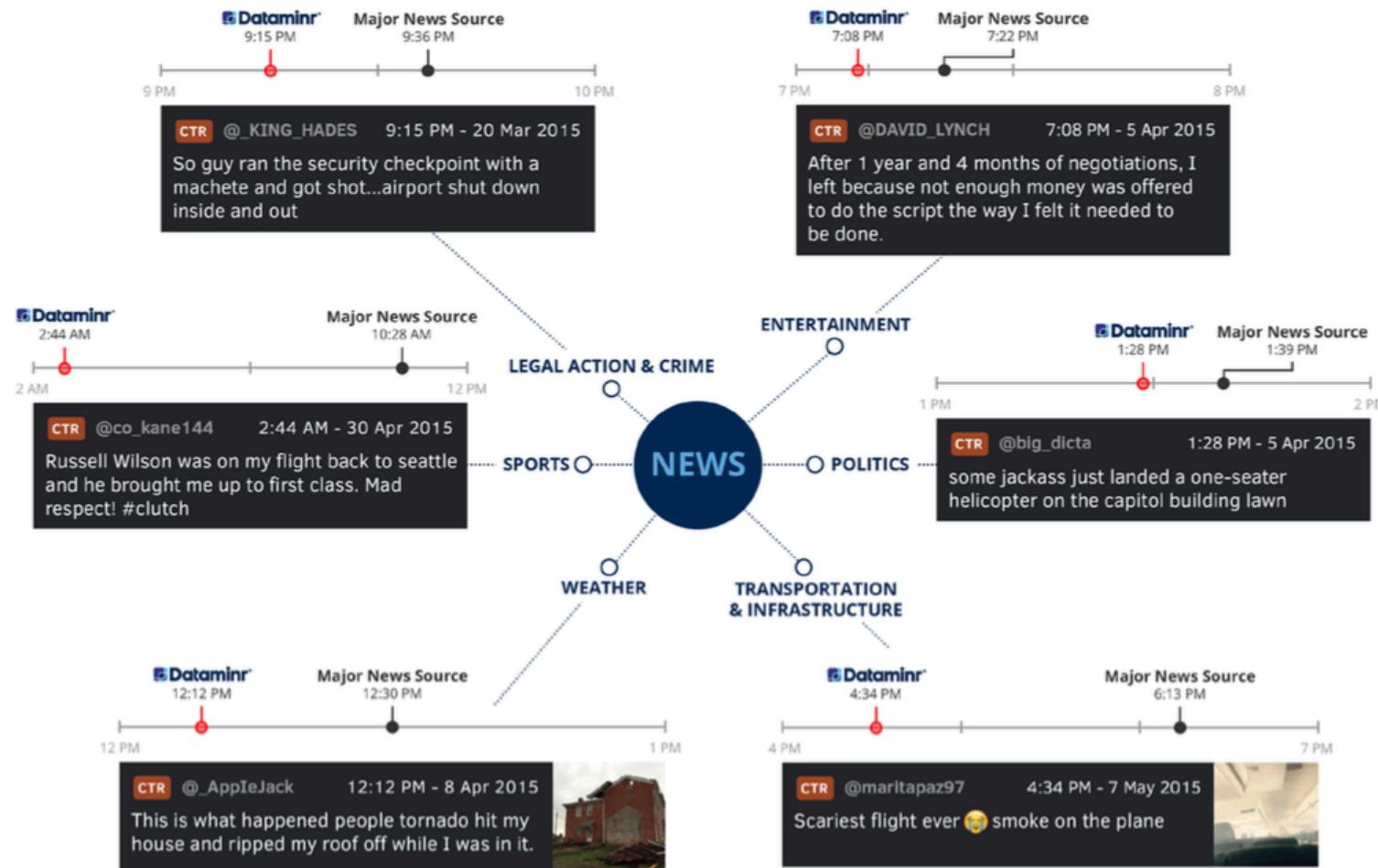
**Direct Interaction  
on Notification Panel –**  
without users interrupting  
what they're doing...



**...More Up Close & Personal –**  
as notifications appear on more  
& more mobile devices



# Users Increasingly First Source for News via Twitter / Dataminr



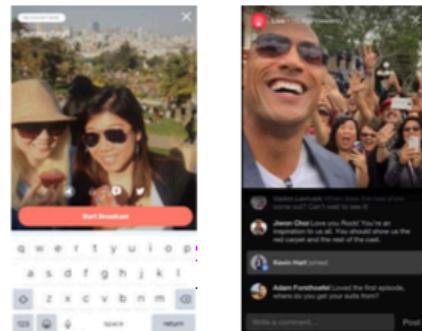
@KPCB

Source: Dataminr, 5/15.

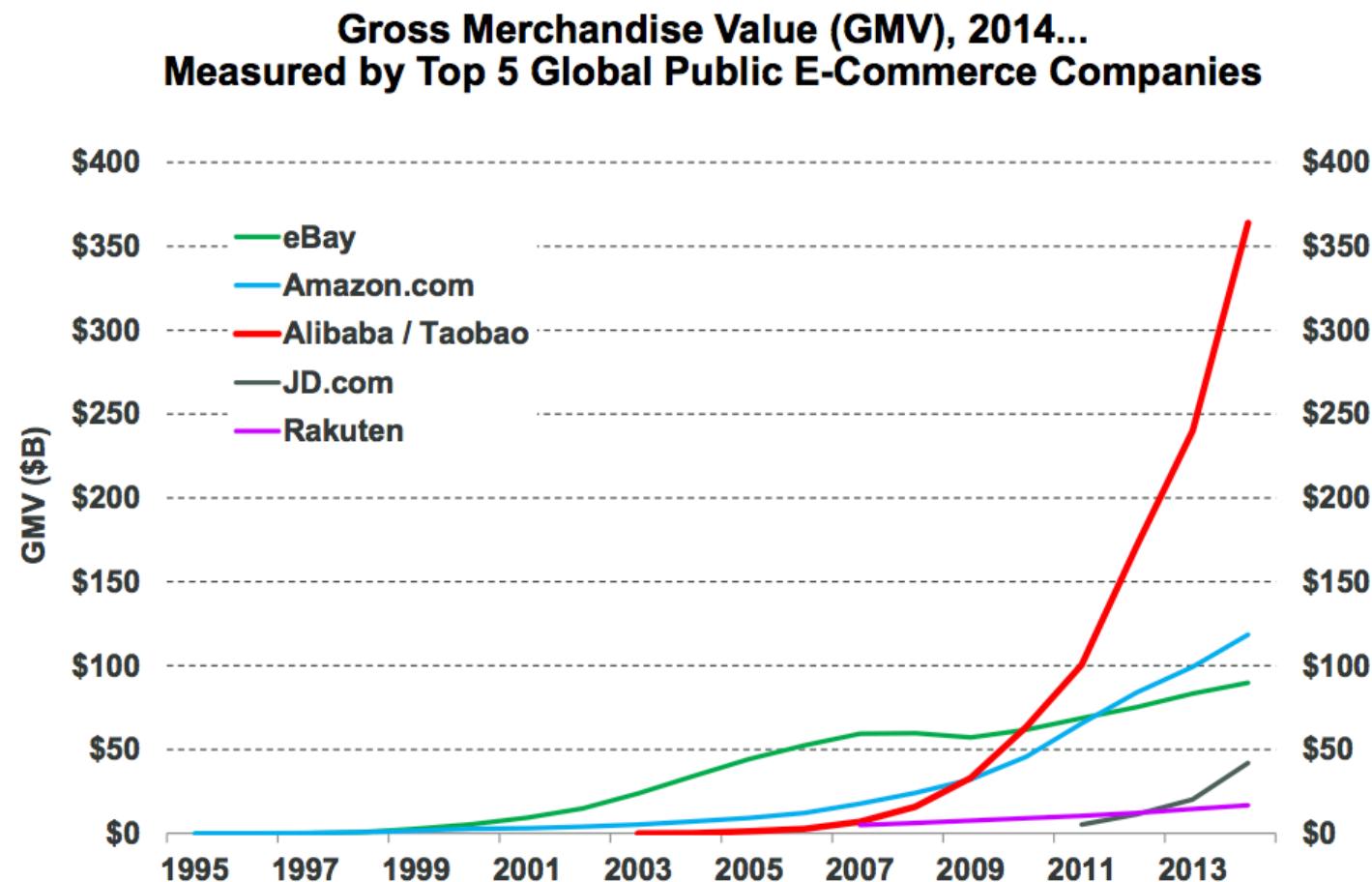
65

# Video Evolution = Accelerating

Live (Linear) → On-Demand → Semi-Live → Real-Live

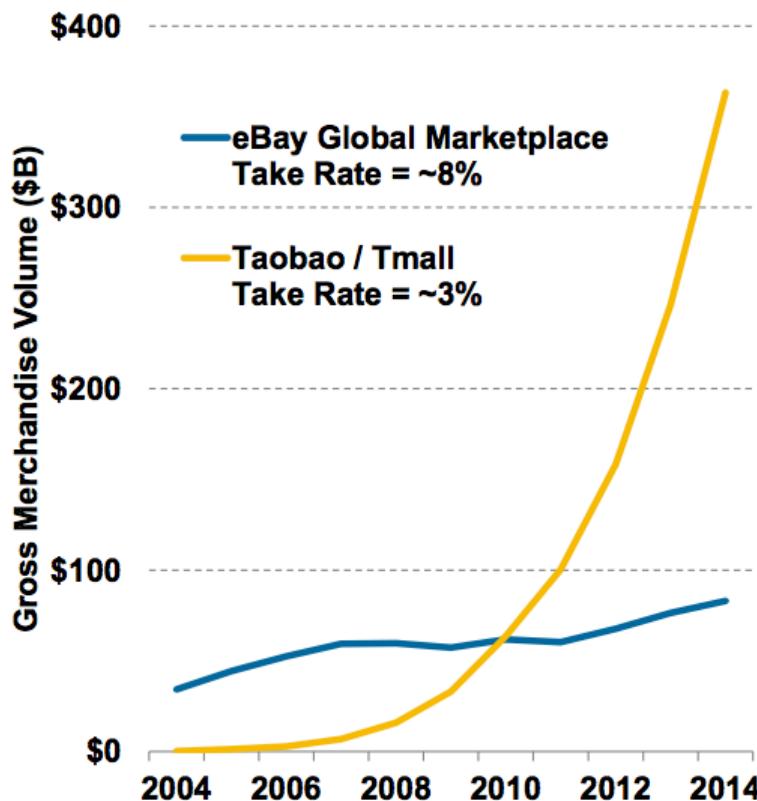
Live (Linear)	On-Demand	Semi-Live	Real-Live
<i>Traditional TV 1926</i>	<i>DVR / Streaming 1999</i>	<i>Snapchat Stories 2013</i>	<i>Periscope + Facebook Live 2015 / 2016</i>
Tune-In or Miss Out	Watch on Own Terms	Tune-In Within 24 Hours or Miss Out	Tune-In / Watch on Own Terms
Mass Concurrent Audience	Mass Disparate Audience	Mostly Personal Audience	Mass Audience, yet Personal
Real-Time Buzz	Anytime Buzz	Anytime Buzz	Real Time + Anytime Buzz
	 		

1st Generation 'Online Platforms / Marketplaces for *Products* Rising =  
Optimized for Desktop Internet + Traditional Shipping Delivery

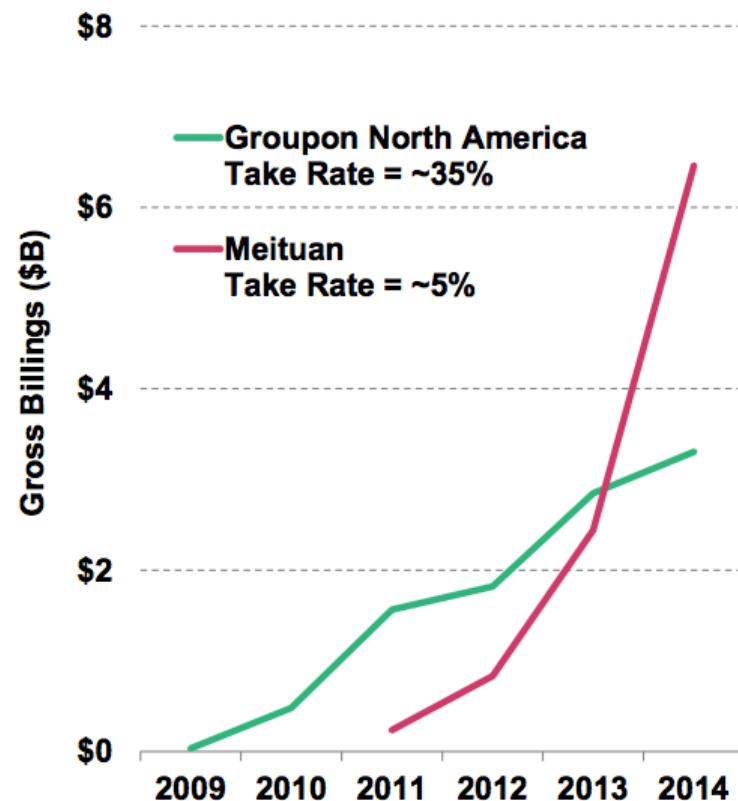


## China E-Commerce = Low Take Rates\* Helped China Marketplace Leaders Pass USA Peers

**Gross Merchandise Value, 2004 – 2014**  
eBay vs. Alibaba (Taobao / Tmall)



**Gross Billings, 2009 – 2014**  
Groupon N. America vs. Meituan



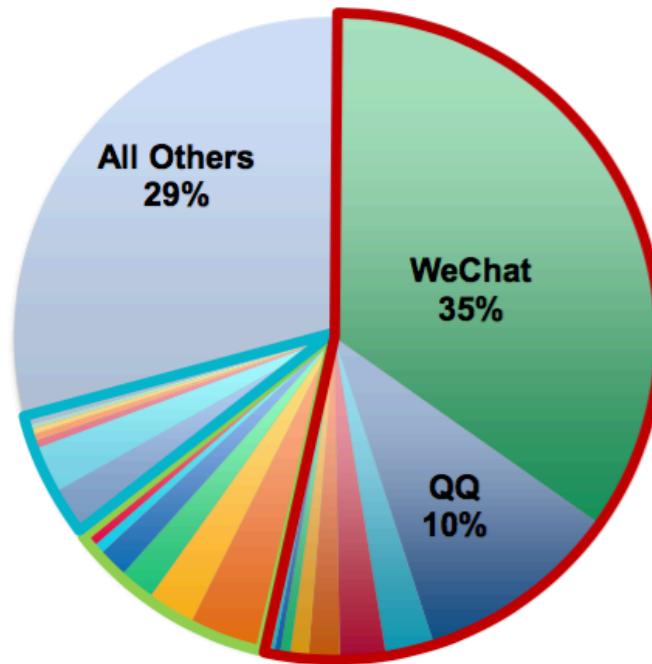
@KPCB

Source: Meituan gross billings data are estimates by Tuan800.com, eBay, Groupon, Alibaba GMV data per company.  
 Note: Take rate defined as net revenue divided by gross merchandise value or gross billings. eBay marketplace take rate excludes PayPal (~3%),  
 eBay, Alibaba GMV data per company. Meituan take rate is estimate per media report.

Hillhouse Capital  
158

# China Mobile Internet Usage Leaders... Tencent + Alibaba + Baidu = 71% of Mobile Time Spent

Share of Mobile Time Spent, April 2016  
Daily Mobile Time Spent = ~200 Minutes per User, Average



Tencent

- WeChat
- QQ
- QQ Browser
- Tencent Video
- Tencent News
- Tencent Games
- QQ Music
- JD.com
- QQ Reading

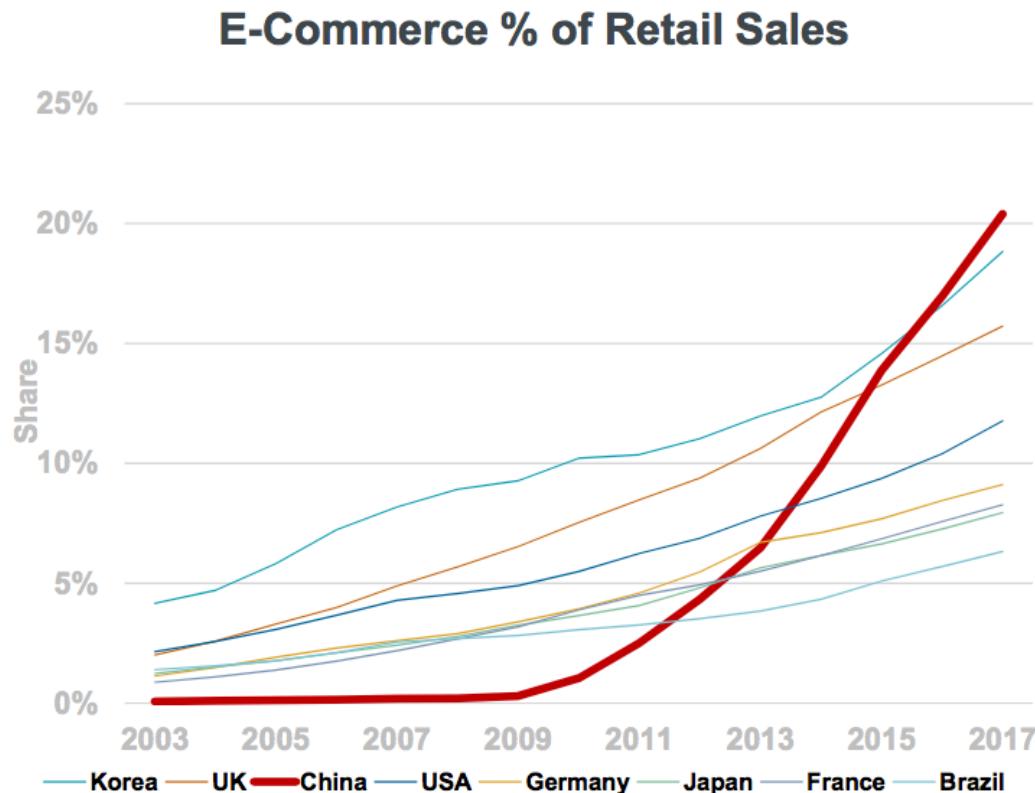
Alibaba

- UCWeb Browser
- Taobao
- Weibo
- YouKu Video
- Momo
- Shuqi Novel
- AliPay
- AutoNavi

Baidu

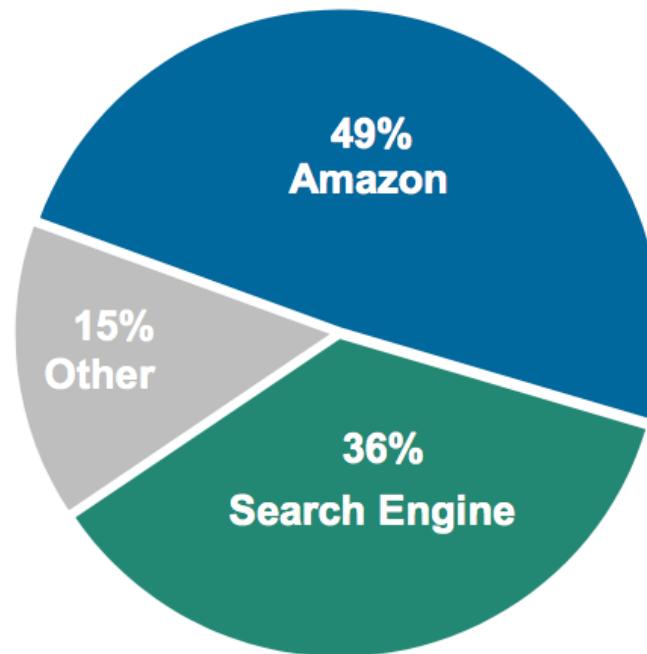
- Mobile Baidu
- iQiyi / PPS Video
- Baidu Browser
- Baidu Tieba
- 91 Desktop
- Baidu Maps
- All Other

# Worldwide E-Commerce Share Gains Continue... China @ 20% = Highest Penetration Rate + Fastest Growing

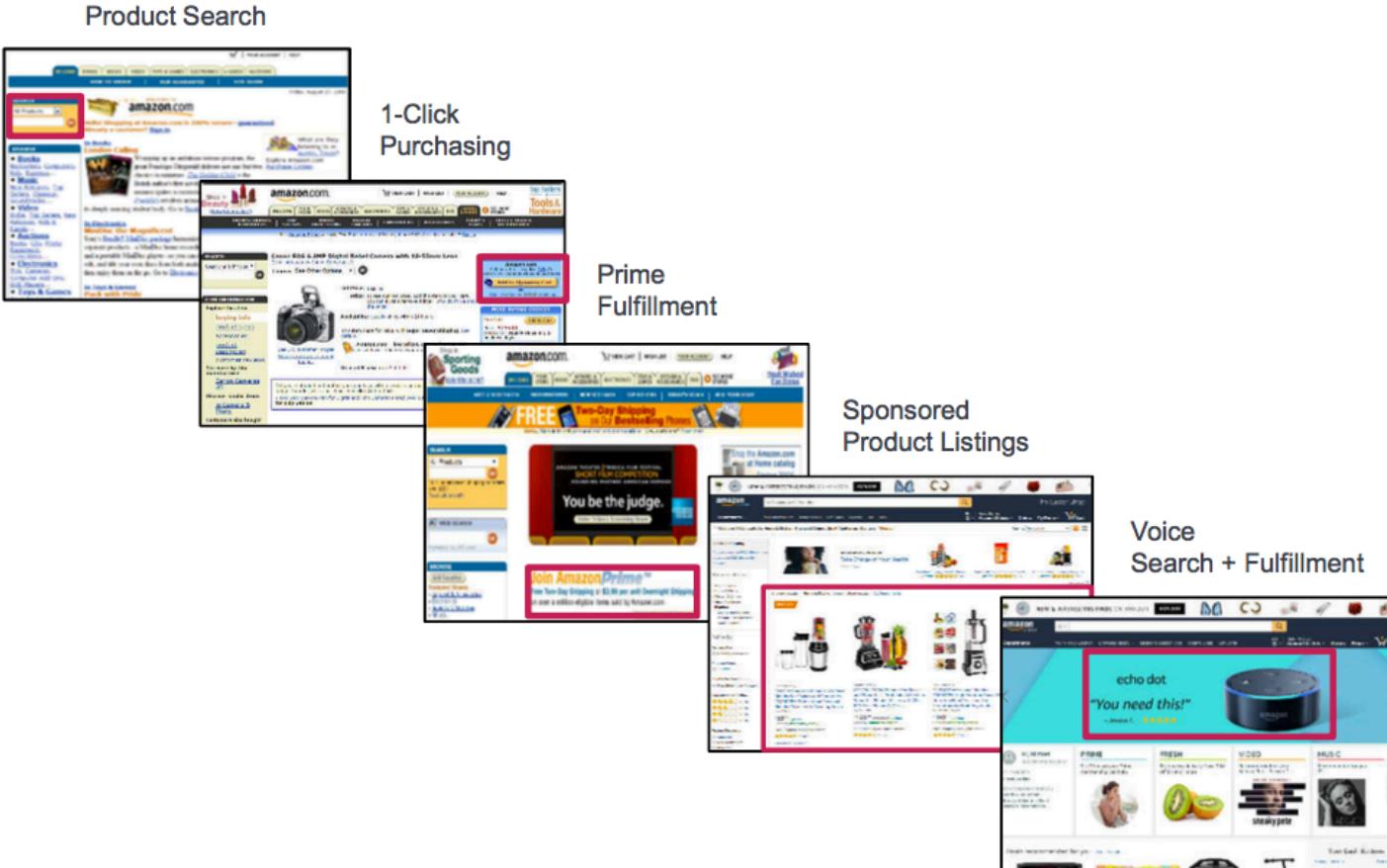


# Product Finding = Often Starts @ Search (Amazon + Google...)

*Where Do You Begin Your Product Search?*



# Product Finding (Amazon) = Started @ Search...Fulfilled by Amazon



# Product Finding (Google) = Started @ Search...Fulfilled by Others

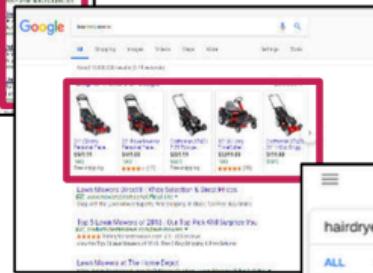
Organic Search



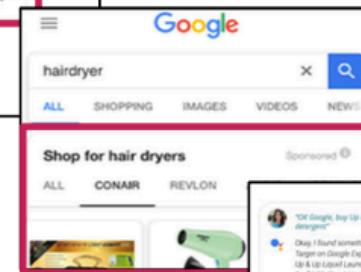
Paid  
Search



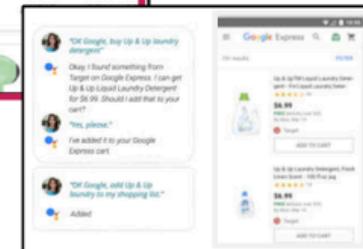
Google  
Shopping



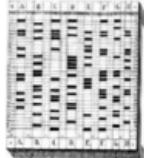
Product  
Listing Ads



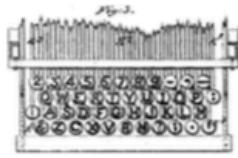
Shopping  
Actions



# Human-Computer Interaction (1830s – 2015), USA = Touch 1.0 → Touch 2.0 → Touch 3.0 → Voice



Punch Cards for  
Informatics  
1832



QWERTY  
Keyboard  
1872



Electromechanical  
Computer (Z3)  
1941



Electronic Computer  
(ENIAC)  
1943



Paper Tape Reader  
(Harvard Mark I)  
1944



Mainframe Computers  
(IBM SSEC)  
1948



Trackball  
1952



Joystick  
1967



Microcomputers  
(IBM Mark-8)  
1974



Portable Computer  
(IBM 5100)  
1975



Commercial Use of  
Window-Based GUI  
(Xerox Star)  
1981



Commercial Use  
of Mouse  
(Apple Lisa)  
1983



Commercial Use  
of Mobile  
Computing  
(PalmPilot)  
1996



Touch + Camera -  
based Mobile  
Computing  
(iPhone 2G)  
2007



Voice on Mobile  
(Siri)  
2011

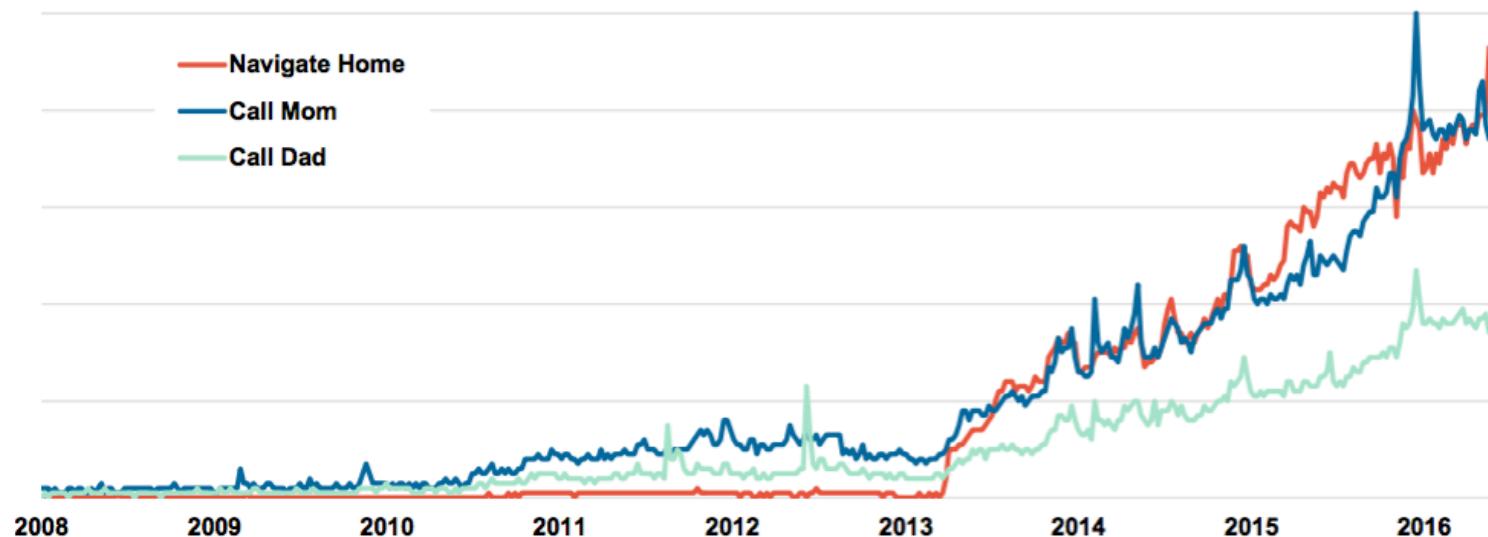


Voice on Connected /  
Ambient Devices  
(Amazon Echo)  
2014

# Google Voice Search Queries = Up >35x Since 2008 & >7x Since 2010, per Google Trends

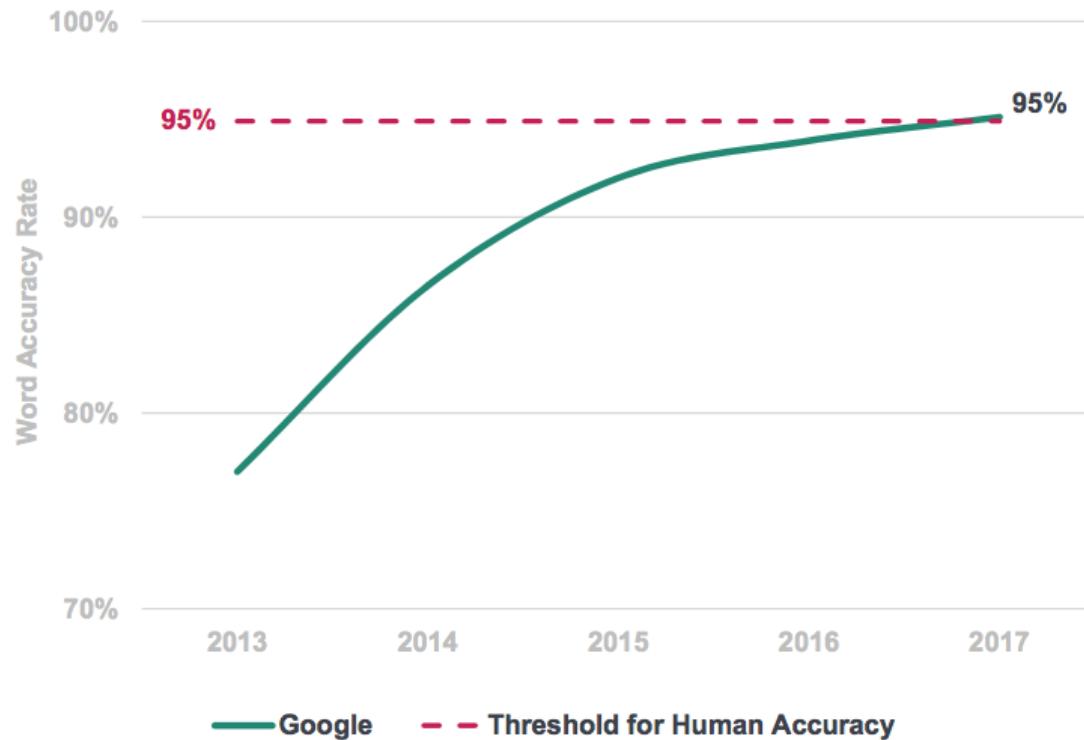
*Google Trends imply queries associated with voice-related commands have risen >35x since 2008 after launch of iPhone & Google Voice Search*

**Google Trends, Worldwide, 2008 – 2016**



# Voice = Technology Lift Off...

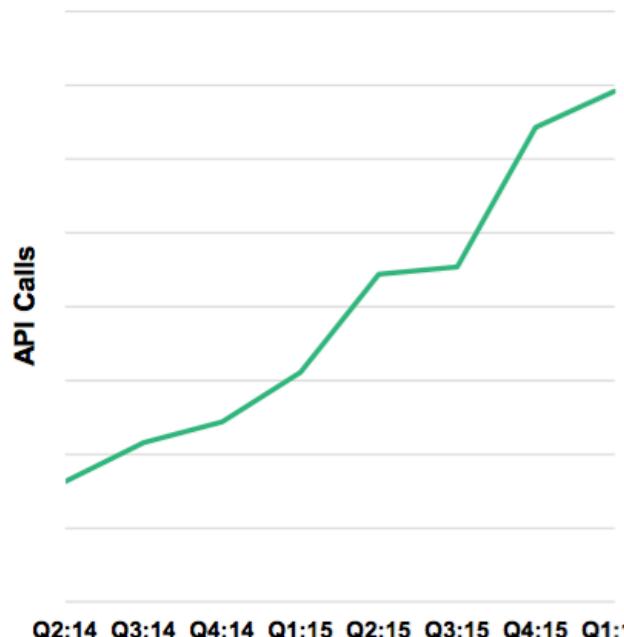
## Google Machine Learning Word Accuracy



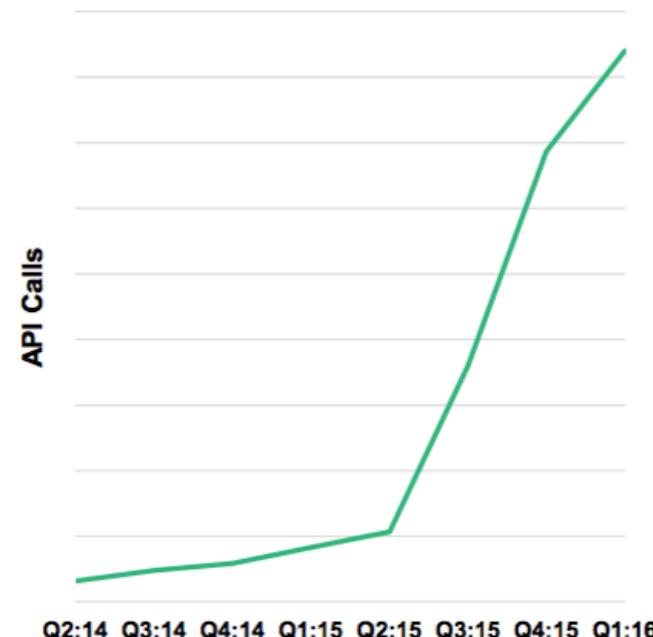
# Baidu Voice = Input Growth >4x...Output >26x, Since Q2:14

*Usage across all Baidu products growing rapidly...typing Chinese on small cellphone keyboard even more difficult than typing English...Text-to-Speech supplements speech recognition & key component of man-machine communications using voice*

**Baidu Speech Recognition Daily Usage by API Calls,  
Global, 2014 – 2016<sup>1</sup>**



**Baidu Text to Speech (TTS) Daily Usage by API Calls,  
Global, 2014 – 2016<sup>2</sup>**



Source: Baidu

Note: (1) Data shown is growth of speech recognition at Baidu, as measured by the number of API calls to Baidu's speech recognition system across time, from multiple products. Most of these API calls were for Mandarin speech recognition. (2) Data shown is growth of TTS (text to speech) at Baidu, in terms of the total number of API calls to Baidu's TTS system across time, from multiple products. Most of these API calls were for Mandarin TTS.

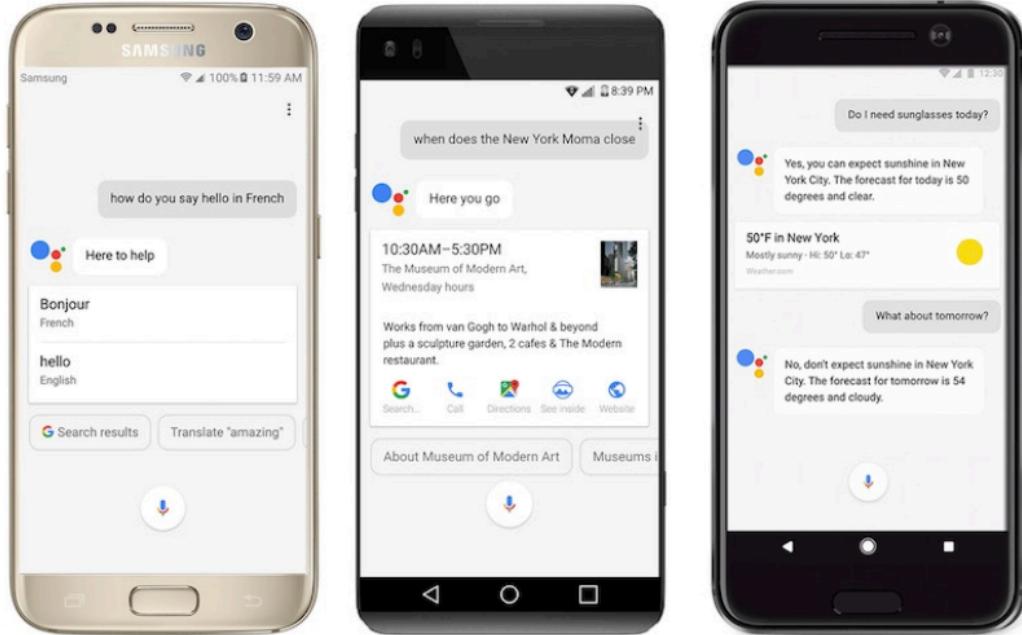


# Voice-Based Mobile Platform Front-Ends = Voice Can Replace Typing

## Google Assistant

Nearly 70% of Requests are Natural / Conversational Language, 5/17

20% of Mobile Queries Made via Voice, 5/16



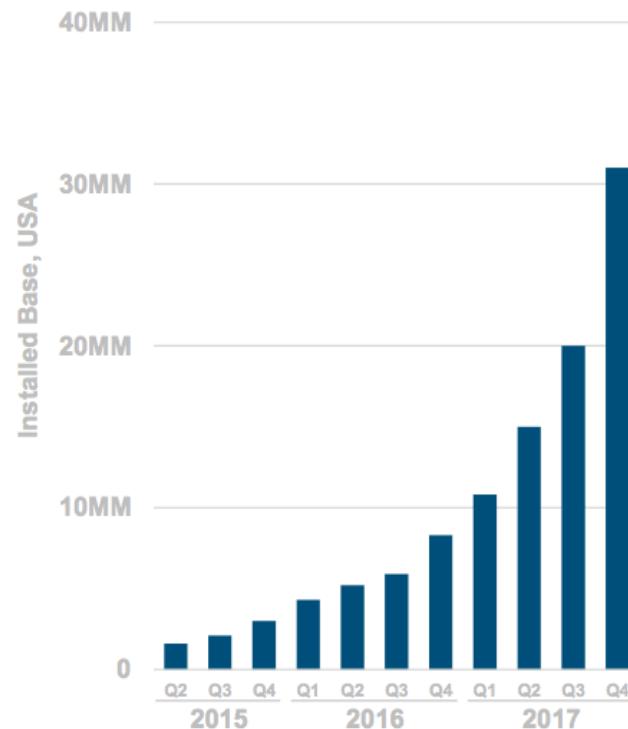
KLEINER  
PERKINS

Source: Google I/O (5/16), Image: Macrumors (2/17)

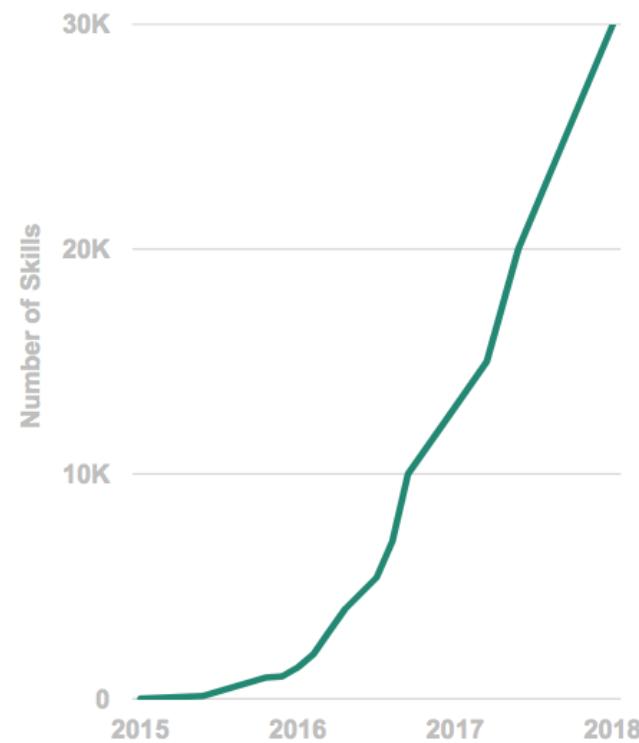
KP INTERNET TRENDS 2017 | PAGE 46

# ...Voice = Product Lift Off

## Amazon Echo Installed Base



## Amazon Echo Skills



Is it a Car...Is it a Computer?...

*Is it a Phone...Is it a Camera?*



*Is it a Car...Is it a Computer?*



...One Can...

Lock / Monitor / Summon One's Tesla from One's Wrist



# Tesla Voice Commands

V10.2 Tesla Voice Commands - X | Tesla Voice Commands - Made x +

docs.google.com/spreadsheets/d/tv4m7aiHk\_KdfkoedDsiChxlbTvSg9... |

File Edit View Insert Format Data Tools Add-ons Help

Share

View only

https://teslavoice.glideapp.io

1 Tesla Voice Commands - V10.2 and Beyond Add by using this form: https://forms.gle/eBugENRJDyvPiogh7

2 Updated 9:32pm CST, 1/14/2020 - 140 commands! https://docs.google.com/spreadsheets/d/e/2PACX-1vC

3 PLEASE NOTE: List updates occur at least once each day

4 Thanks for your patience as we take time to try out the submissions before adding them to

5 Questions, concerns, corrections? Tweet to @LifeMiddle or email lifewithmiddle@gmail.com

6 System (Color Background=Six Only) Command Similar Commands

7 Apps Show/hide calendar

8 Apps Open Browser Open/Close Web, Web, Web Browser

9 Apps Show/hide charging screen Show/Hide Charging

10 Apps Open/Close Easter Eggs

11 Apps Open/Close Energy [App] Open/Show Energy Graph

12 Apps Open/Close Phone

13 Apps Open/Close Toybox

14 Bug Reporting [File] Bug report [brief description]

15 Bug Reporting Report Error

16 Bug Reporting Take a screenshot

17 Car Controls Adjust mirrors Adjust Driver/left/My Mirror, Adjust right mirror (adjust p

18 Car Controls Adjust steering wheel

19 Car Controls Eject Passenger Seat Turns passenger seat heater to high

20 Car Controls Enable/Disable sentry mode Keep Summer Safe, Keep Tesla Safe

21 Car Controls Fold/Unfold mirrors Open/Close Mirrors

22 Car Controls Lock/unlock doors Lock/Unlock

23 Car Controls Lock/Unlock Windows Turn window lock on/off, enable/disable window locks

24 Car Controls My butt is cold Surprisingly, "My butt is (too) hot" says it'll turn down th

25 Car Controls Open/Close charge port door Open Charge Port

26 Car Controls Open/Close Internet Set XXX seat [heat] 1 (2 or 3) bacon

27 Car Controls Set (XXX) Seat Heater to (YYYY)

28 Car Controls Set front seats to YYY

29 Car Controls Set rear seats to YYY

30 Car Controls Set wipers [to] auto /1/2/3/4 [Turn windshield] wipers (auto/on/off/medium/high)

31 Car Controls Show Homellink Settings

32 Car Controls Show Wi-Fi [Settings]

33 Car Controls Show/Close Backup/Rear Camera

34 Car Controls Show/Close Bluetooth

Commands List Explore

V10.2 Tesla Voice Commands - X | Tesla Voice Commands - Made x +

docs.google.com/spreadsheets/d/tv4m7aiHk\_KdfkoedDsiChxlbTvSg9... |

teslavoice.glideapp.io

2:31 Categories

Apps (7)

Bug Reporting (3)

Car Controls (34)

Car Info (3)

Configuration (11)

Easter Eggs (3)

Future (12)

Games (2)

HVAC (24)

Interior Controls (3)

Media (11)

Model S and X Only (1)

Navigation (12)

Categories Commands What's New Submit

Scan with camera to install app. Learn how.





**Tesla Voice Commands**

by Pirin

Crowdsourced reference of Voice Commands discovered in latest versions of Tesla OS

SHARE APP

MAKE YOUR OWN APP WITH glide.

<https://teslavoice.glideapp.io/>

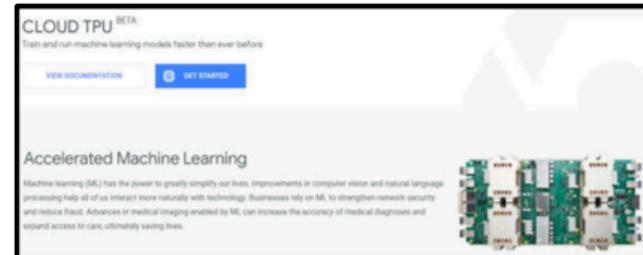
# ...Google = AI Platform Emerging from Google Cloud... Enabling Easier Data Processing / Collection for Others

## Google Cloud AI Services / Infrastructure

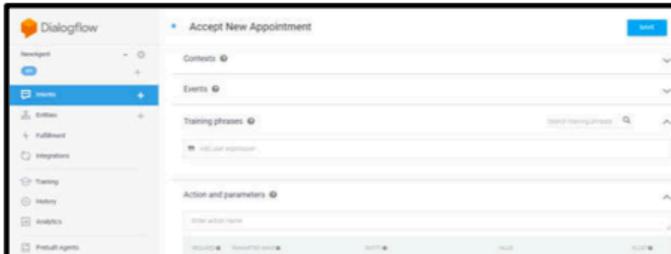
Google Cloud Vision API



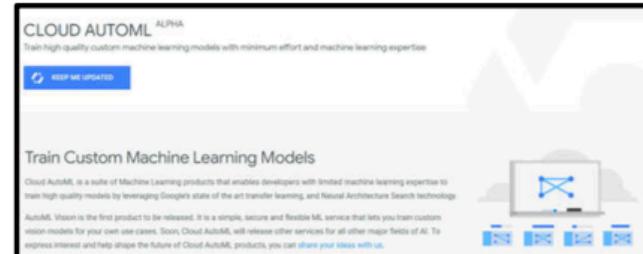
AI Hardware – Tensor Processing Units



Dialogflow Conversational Platform

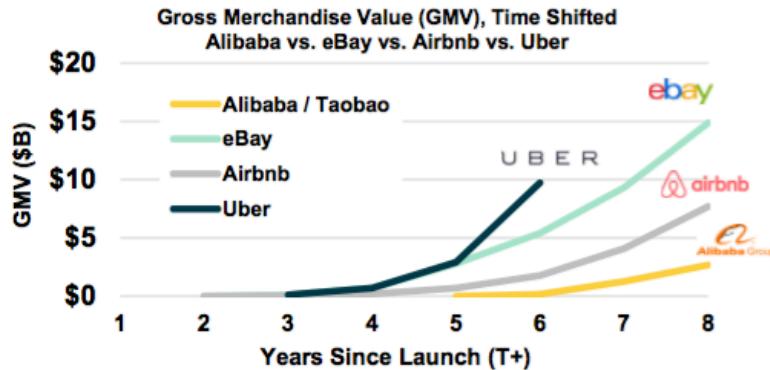


Cloud AutoML – Custom Models

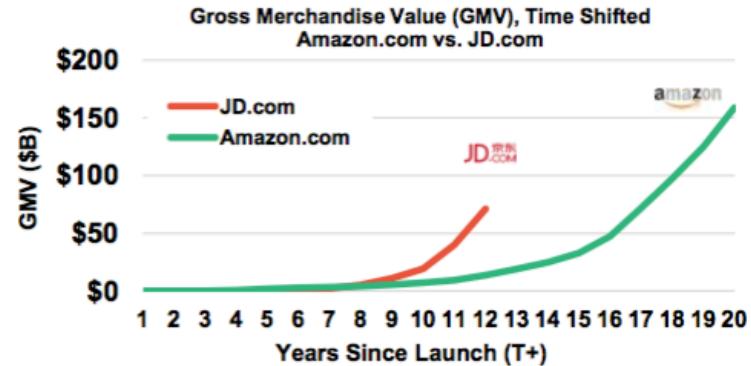


# Current Generation of Internet Leaders = Growing Faster than Previous Generation

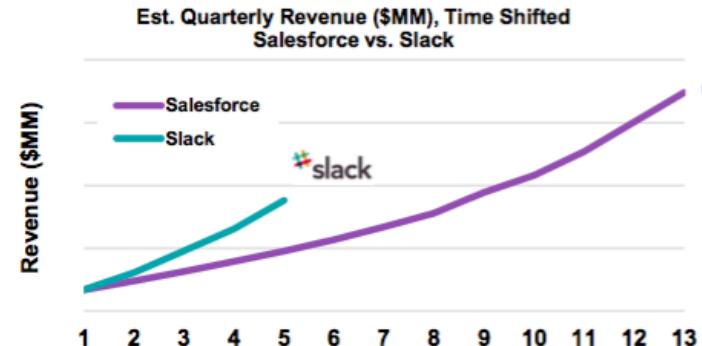
## Marketplaces



## Commerce



## Enterprise



# Today's Top 20 Worldwide Internet Leaders 5 Years Ago\* = USA @ 9...China @ 2...

*Public / Private Internet Companies, Ranked by Market Valuation (5/29/18)*

Rank	2018 Company	Region	Market Value (\$B)	
			5/29/13	Total
1)	Apple	USA	\$418	
2)	Amazon	USA	121	
3)	Microsoft	USA	291	
4)	Google / Alphabet	USA	288	
5)	Facebook	USA	56	
6)	Alibaba	China	--	
7)	Tencent	China	71	
8)	Netflix	USA	13	
9)	Ant Financial	China	--	
10)	eBay + PayPal**	USA	71	
11)	Booking Holdings	USA	41	
12)	Salesforce.com	USA	25	
13)	Baidu	China	34	
14)	Xiaomi	China	--	
15)	Uber	USA	--	
16)	Didi Chuxing	China	--	
17)	JD.com	China	--	
18)	Airbnb	USA	--	
19)	Meituan-Dianping	China	--	
20)	Toutiao	China	--	
			Total	\$1,429

Source: CapIQ, CB Insights, The Wall Street Journal, media reports. \*Only includes public companies in 2013. \*\*eBay + PayPal combined for comparison purposes though PayPal spun-off of eBay on 7/20/15.

# ...Today's Top 20 Worldwide Internet Leaders Today = USA @ 11...China @ 9

*Public / Private Internet Companies, Ranked by Market Valuation (5/29/18)*

Rank 2018	Company	Region	Market Value (\$B)	
			5/29/13	5/29/18
1)	Apple	USA	\$418	\$924
2)	Amazon	USA	121	783
3)	Microsoft	USA	291	753
4)	Google / Alphabet	USA	288	739
5)	Facebook	USA	56	538
6)	Alibaba	China	--	509
7)	Tencent	China	71	483
8)	Netflix	USA	13	152
9)	Ant Financial	China	--	150
10)	eBay + PayPal*	USA	71	133
11)	Booking Holdings	USA	41	100
12)	Salesforce.com	USA	25	94
13)	Baidu	China	34	84
14)	Xiaomi	China	--	75
15)	Uber	USA	--	72
16)	Didi Chuxing	China	--	56
17)	JD.com	China	--	52
18)	Airbnb	USA	--	31
19)	Meituan-Dianping	China	--	30
20)	Toutiao	China	--	30
		Total	\$1,429	\$5,788

Source: CapIQ, CB Insights, Wall Street Journal, media reports. \*eBay + PayPal combined for comparison purposes though PayPal spin-off of eBay on 7/20/15. Market value data as of 5/29/18. The Wall Street Journal, Recode, TechCrunch, Reuters, and the Information articles detail the latest valuations for Ant Financial (4/18), Xiaomi (5/18), Uber (2/18), Didi Chuxing (12/17), Airbnb (3/17), Meituan-Dianping (10/17), and Toutiao (12/17).

# USA = 56% of Most Highly Valued Tech Companies Founded By... 1<sup>st</sup> or 2<sup>nd</sup> Generation Americans...1.7MM Employees, 2017

## Immigrant Founders / Co-Founders of Top 25 USA Valued Public Tech Companies, Ranked by Market Capitalization

Rank	Company	Mkt Cap (\$MM)	LTM Rev (\$MM)	Employees	Founder / Co-Founder (1st / 2nd Gen Immigrant)	Generation
1	Apple	\$923,554	\$239,176	123,000	Steve Jobs	2 <sup>nd</sup> – Syria
4	Amazon.com	782,608	177,866	566,000	Jeff Bezos	2 <sup>nd</sup> – Cuba
3	Microsoft	753,030	95,652	124,000	--	--
2	Alphabet / Google	739,122	110,855	80,110	Sergey Brin	1 <sup>st</sup> – Russia
5	Facebook	537,648	40,653	25,105	Eduardo Saverin	1 <sup>st</sup> – Brazil
6	Intel	257,791	62,761	102,700	--*	--
7	Cisco	202,083	48,096	72,900	--	--
8	Oracle	188,848	39,472	138,000	Larry Ellison / Bob Miner	2 <sup>nd</sup> – Russia / 2 <sup>nd</sup> – Iran
11	Netflix	152,025	11,693	4,850	--	--
10	NVIDIA	150,894	9,714	10,299	Jensen Huang	1 <sup>st</sup> – Taiwan
9	IBM	129,635	79,139	366,600	Herman Hollerith	2 <sup>nd</sup> – Germany
12	Adobe Systems	119,271	7,699	17,973	--	--
13	Booking.com	100,013	12,681	22,900	--	--
14	Texas Instruments	108,912	14,961	29,714	Cecil Green / J. Erik Jonsson Max Levchin / Luke Nosek / Peter Thiel / Elon Musk***	1 <sup>st</sup> – UK / 2 <sup>nd</sup> – Sweden 1 <sup>st</sup> – Ukraine / 1 <sup>st</sup> – Poland / 1 <sup>st</sup> – Germany / 1 <sup>st</sup> – South Africa
15	PayPal	95,858	13,094	18,700	--	--
16	Salesforce.com	94,260	10,480	25,000	--	--
17	Qualcomm	86,333	22,360	33,800	Andrew Viterbi	1 <sup>st</sup> – Italy
19	Automatic Data Processing	57,237	12,790	58,000	Henry Taub	2 <sup>nd</sup> – Poland
21	VMware	55,282	7,922	20,615	Edouard Bugnion	1 <sup>st</sup> – Switzerland
20	Activision Blizzard	53,772	7,017	9,625	--	--
18	Applied Materials	52,439	15,463	18,400	--	--
23	Intuit	50,471	5,434	8,200	--	--
22	Cognizant Technology	43,597	14,810	260,000	Francisco D'Souza / Kumar Mahadeva	1 <sup>st</sup> – India** / 1 <sup>st</sup> – Sri Lanka
24	eBay	37,304	9,567	14,100	Pierre Omidyar	1 <sup>st</sup> – France
25	Electronic Arts	34,763	4,845	8,800	--	--

KLEINER PERKINS  
2018  
INTERNET TRENDS

Source: CapIQ as of 4/16/18. "The 'New American' Fortune 500" (2011), a report by the Partnership for a New American Economy, as well as "Reason for Reform: Entrepreneurship" (10/16). "American Made, The Impact of Immigrant Founders & Professionals on U.S. Corporations." \*While Andy Grove (from Hungary) is not a co-founder of Intel, he joined as COO on the day it was incorporated. \*\*Francisco D'Souza is a person of Indian origin born in Kenya. \*\*\*Max Levchin / Luke Nosek / Peter Thiel's startup Confinity merged with Elon Musk's startup X.com to form PayPal in 3/00.

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# USA = Many Highly Valued Private Tech Companies Founded By... 1st Generation Immigrants

Company	Immigrant Founder / Co-Founder	Country of Origin	Market Value (\$B)
Uber	Garrett Camp	Canada	\$72
SpaceX	Elon Musk	South Africa	25
Palantir	Peter Thiel	Germany	21
WeWork	Adam Neumann	Israel	21
Stripe	John Collison, Patrick Collison	Ireland	9
Wish (ContextLogic)	Peter Szulczeński, Danny Zhang	Canada	9
Moderna Therapeutics	Noubar Afeyan, Derrick Rossi	Armenia / Canada	8
Robinhood	Baiju Bhatt, Vlad Tenev	India / Bulgaria	6
Slack	Stewart Butterfield, Serguei Mourachov, Cal Henderson	Canada / Russia / UK	5
Tanium	David Hindawi	Iraq	5
Credit Karma	Kenneth Lin	China	4
Houzz	Adi Tatarko, Alon Cohen	Israel	4
Instacart	Apoorva Mehta	India	4
Bloom Energy	KR Sridhar	India	3
Oscar Health	Mario Schlosser	Germany	3
Unity Technologies	David Helgason	Iceland	3
Avant	Al Goldstein, John Sun, Paul Zhang	Uzbekistan / China / China	2
Zenefits	Laks Srinivasan	India	2
AppNexus	Mike Nolet	Holland	2
ZocDoc	Oliver Kharraz	Germany	2
Sprinklr	Ragy Thomas	India	2
Compass	Ori Allon	Israel	2

Company	Immigrant Founder / Co-Founder	Country of Origin	Market Value (\$B)
JetSmarter	Sergey Petrossov	Russia	\$2
Warby Parker	Dave Gilboa	Sweden	2
Carbon3D	Alex Ermoshkin	Russia	2
Infinidat	Moshe Yanai	Israel	2
Tango	Uri Raz, Eric Setton	Israel / France	2
Quanergy	Louay Eldada, Tianyue Yu	Lebanon / China	2
Zoox	Tim Kentley-Klay	Australia	2
Eventbrite	Renaud Visage	France	2
Apttus	Kirk Krappe	UK	2
Cloudflare	Michelle Zatlyn	Canada	2
Proteus Digital Health	Andrew Thompson	UK	2
Anaplan	Guy Haddleton, Michael Gould	New Zealand / UK	1
Rubrik	Bipul Sinha	India	1
OfferUp	Arean Van Veen	Netherlands	1
Actifio	Ash Ashutosh	India	1
Gusto	Tomer London	Israel	1
Medallia	Borge Hald	Norway	1
FanDuel	Nigel Eccles, Tom Griffiths, Lesley Eccles	UK	1
AppDirect	Daniel Saks, Nicolas Desmarais	Canada	1
Evernote	Stepan Pachikov, Phil Libin	Azerbaijan / Russia	1
Udacity	Sebastian Thrun	Germany	1
UiPath*	Daniel Dines, Marius Tirca	Romania	1
Zoom Video	Eric Yuan	China	1

# IoT is ...

a proposed development of the Internet in which everyday objects have network connectivity, allowing them to send and receive data.

Google Definition

The Internet of Things (**IoT**) is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

Gartner

The Internet of Things (**IoT**) has been defined in Recommendation [ITU-T.Y.2060](#) (06/2012) as a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

ITU

[ 6 slides from Al Brown, CTO of 1 For 1 ]

## **Types of IoT**



## Consumer

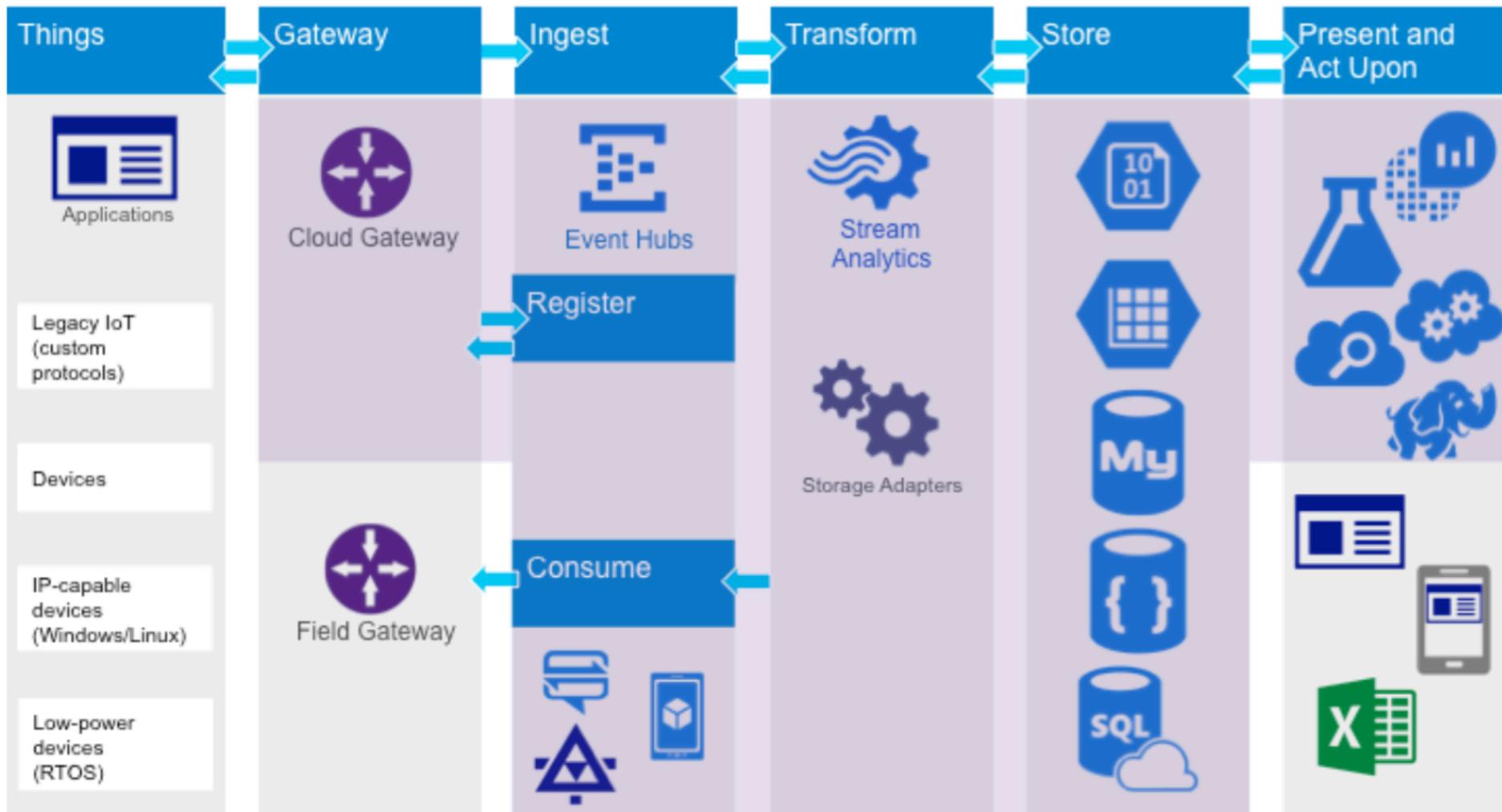


Health



## Industrial

# (NORMAL) IoT Layers



# IoT Protocols

Networks and protocols are mostly not reliable and slow. Plan for it.

Device/Thing to Gateway:

- ZigBee - Wireless sensors
- BLE – Wireless sensors
- ModBus (Serial or TCP)

Gateway to Server:

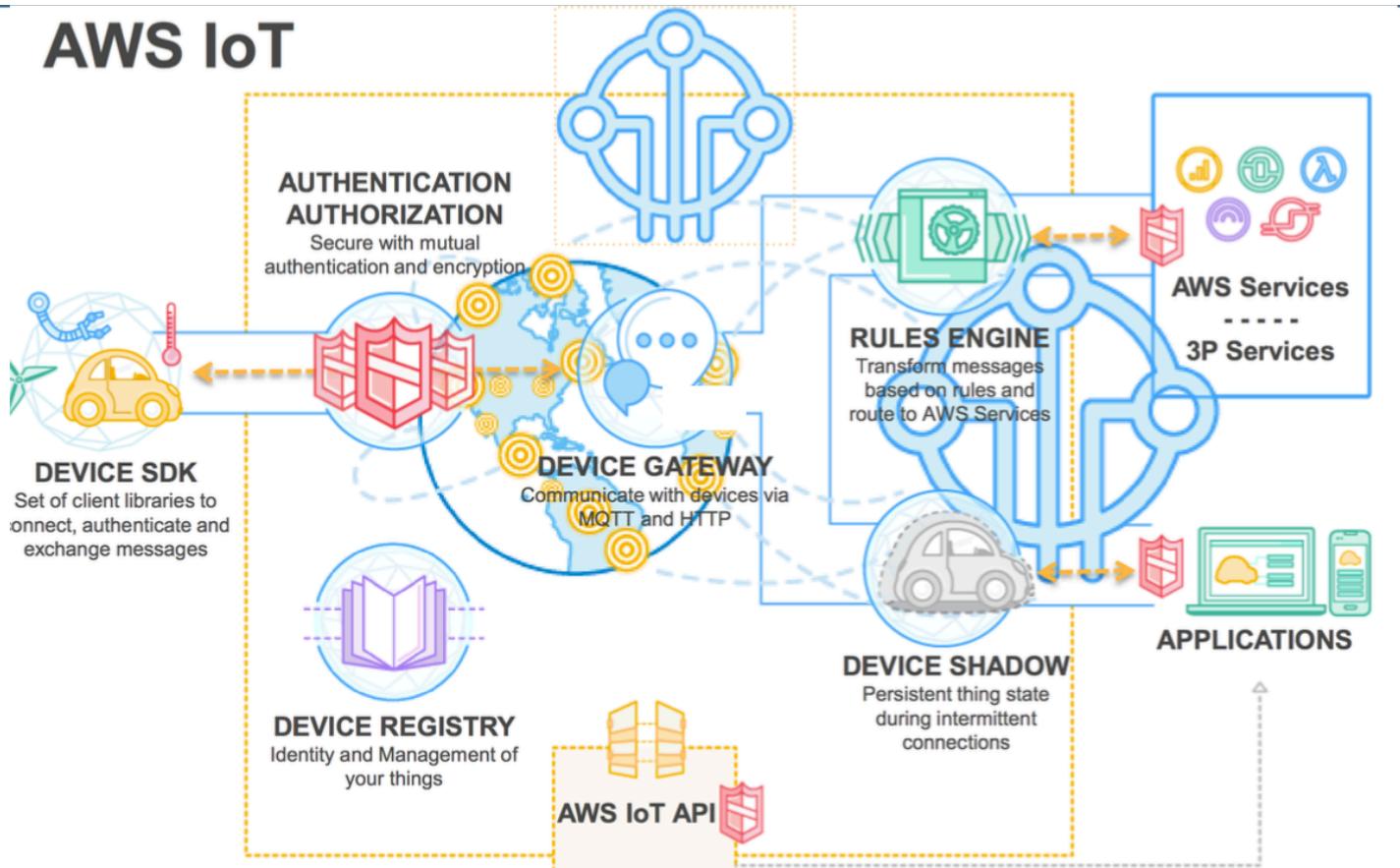
- ModBus TCP – Common
- OPC - Common for industrial assets
- HTTP – JSON over HTTP
- MQTT - Consumer oriented, promising

# IoT Platforms

- Amazon IoT
  - Physical/Shadow Device (Persisted JSON State)
  - MQTT Endpoint
  - Rules
  - AWS Connectivity
- GE Predix 2.0 (PaaS)
  - CloudFoundry, HDP
  - Asset Model, Machine Connectivity, Time Series DB, Analytics Plugin (BPMN)
- PTC ThingWorx
  - Originally HMI for TCP-connected devices
- Xively
  - Device connectivity, time series database, connectivity to applications
  - Popular with Arduino developers

# AWS IoT

## AWS IoT



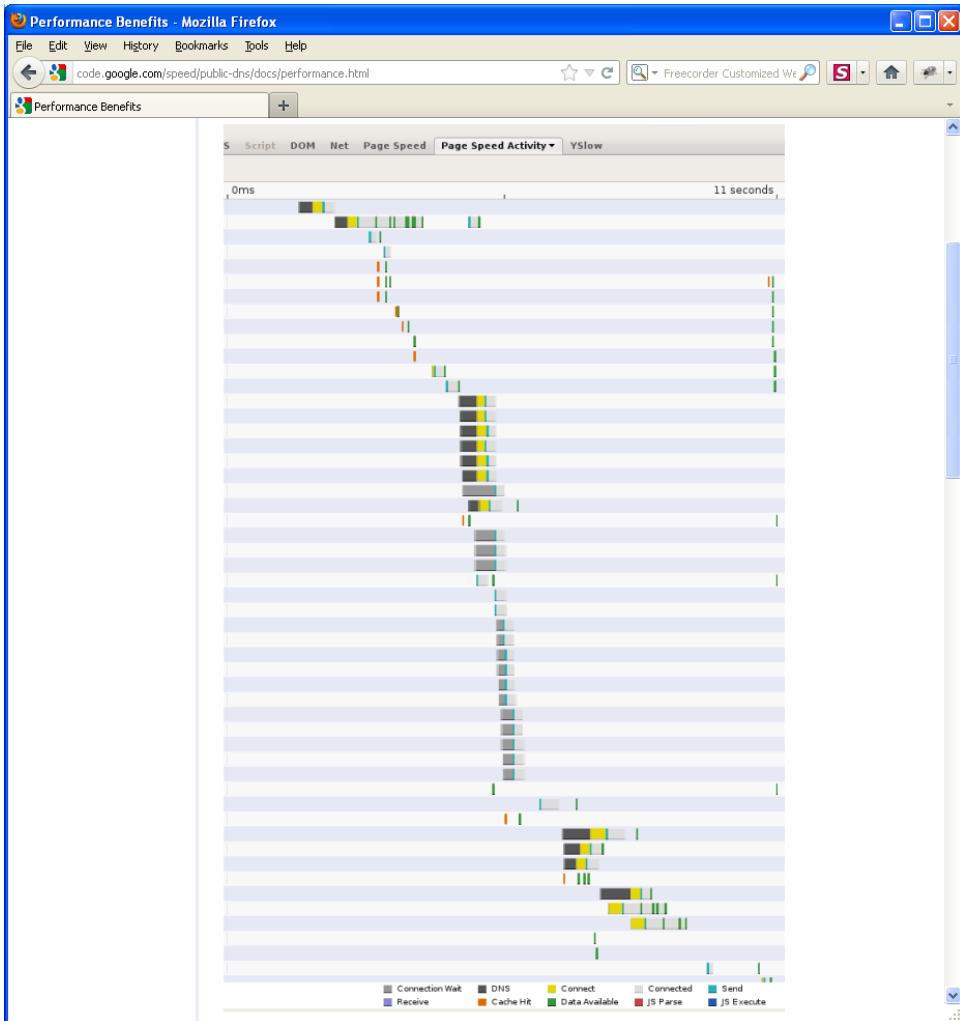
## **Domain Name System**

- Lets focus on one important aspect of the Internet, the domain name system

# DNS (Domain Name System) Resolution

- The DNS protocol is an important part of the web's infrastructure
- Every time you visit a website, your computer performs a DNS lookup
- Complex pages often require multiple DNS lookups before they start loading, so your computer may be performing hundreds of lookups a day
- DNS latency is mainly due to
  - The round-trip time to make the request and get the response, due to network congestion, overloaded servers, denial-of-service attacks
  - Cache misses which cause recursive querying of other name servers
- Google has introduced **Google Public DNS**
  - Configure your network to use 8.8.8.8 and 8.8.4.4
  - Google handles more than 70 billion requests *a day!*
  - Google also has IPv6 addresses
    - 2001:4860:4860::8888 and 2001:4860:4860::8844
  - <http://code.google.com/speed/public-dns/docs/intro.html>
- Another alternative is **opendns.com**
  - They have a global network of DNS resolvers to speed resolution
  - The base service is free, but upgrades cost

# DNS Resolution is a Critical Component of Efficient Web Page Downloading



- The chart shows the times spent loading a page where
  - black represents DNS resolution,
  - Gray represents Connection waiting,
  - Yellow represents connection,
  - red is JavaScript parsing, and
  - blue is JavaScript execution.
- There are 13 calls to the DNS resolver and 5 of them are serial lookups accounting for several seconds of the total 11 seconds spent loading the page

<http://code.google.com/speed/public-dns/docs/performance.html>

# Internet Domain Names

- The Domain Name System is a mapping to/from IP addresses to domain names
  - defined in RFC 1034, 1035, see e.g.
  - <http://www.faqs.org/rfcs/rfc1035.html>
  - Invented in 1983 by Paul Mockapetris **while at USC**, see [http://en.wikipedia.org/wiki/Domain\\_name\\_system](http://en.wikipedia.org/wiki/Domain_name_system)
- There are 13 top level root name servers, see [http://en.wikipedia.org/wiki/Root\\_name\\_server](http://en.wikipedia.org/wiki/Root_name_server)
- Founded in 1998, ICANN is the organization in charge of maintaining the DNS system, see [www.icann.com](http://www.icann.com)



**Internet Corporation for Assigned Names and Numbers**

# Top Level Domain Names

- **In 1984** Top level domains were **originally** divided into the following logical categories
  - com commercial and industrial organizations
  - edu educational institutions
  - gov non-military, government affiliated organizations
  - mil military organizations
  - net network operations
  - org other organizations and user groups
- **In 2001** new top level domains were added
  - .biz, .info, .name, .museum, .coop, .aero, .pro, .xxx
  - [www.internic.net/faqs/new-tlds.html](http://www.internic.net/faqs/new-tlds.html)
- **In 2009** ICANN agreed to accept internationalized domain names, encoded as Unicode. See:
  - <http://www.icann.org/en/resources/idn/fast-track>
- **In 2011** ICANN announced a huge expansion of TLDs, giving requirements for anyone wanting to establish one
  - As of 9/12 they have received 2,000 applications
  - <http://www.icann.org/en/news/announcements/announcement-13jun12-en.htm>

# Domain Name Statistics

Distribution of Top-Level Domain Names  
by Host Count, January 2019, (no longer active)  
at <http://ftp.isc.org/www/survey/reports/2019/01/bynum.txt>

Domain	Hosts =	All Hosts	- Dup Names	Level 2 Domains	Level 3 Domains	
TOTAL	1012695272	1077730537	65035265	4832503	121929359	
net	367709849	376265314	8555465	30635	63743254	Networks
com	171764916	193223063	21459147	289275	23341686	Commercial
jp	74749861	74914275	164414	60402	1243484	Japan
de	4475393	44875251	121658	150103	2265608	Germany
br	36367425	36484685	661533	550	257810	Brazil
it	25101768	25101768	558145	39939	65116	Italy
fr	21101768	23216185	114417	41715	625312	France
cn	19812950	21385254	1572304	8836	23749	China
mx	17918753	19266502	1347749	2691	109655	Mexico
ar	14489705	14711480	227375	41	15419	Argentina
au	14497986	14711480	43795	77	794	Australia
nl	12329780	12548732	218952	63913	29690981	Netherlands
pl	11240083	11305333	65255	27936	1882133	Poland
edu	10635693	1096207	360514	9044	3248976	Educational
ru	10510317	11174765	664448	86063	2625128	Russian Federation
ca	10031616	10240006	38540	38133	10851	Canada
in	83640182	8924006	563824	8085	73387	India
tr	6922403	6943540	21137	29	7674	Turkey
tw	6780226	6852022	71796	1586	27865	Taiwan, Province Of China
co	6673396	6932382	319826	9427	32744	Colombia
za	619157	620896	62089	46	22616	Zambia
so	5521773	5609922	87149	12430	34345	Sweden
be	5362014	5384917	22903	21951	144671	Belgium
ch	5230569	5363918	106349	25871	1302078	Switzerland
uk	5158243	6206332	1048089	1558	109360	United Kingdom
eg	4989280	5004758	15476	39	798	Egypt
es	449773	450004	22824	12307	54472	Spain
fi	3980155	4001608	21453	11336	1818068	Finland
pt	3820151	3837388	17237	7294	261028	Portugal
at	3650990	3669590	18600	25815	352943	Austria
no	3422043	3450893	28850	14143	247748	Norway
th	337476	3400000	12180	19	708	Thailand
cl	3313392	3395473	82142	10569	65045	Chile
nz	2933595	3454503	519108	429	23237	New Zealand
cz	2913384	2937528	24144	22538	655923	Czech Republic
hu	2666464	2675424	8962	16883	501101	Hungary
gr	2386394	2388251	3161	6920	54172	Greece
arpa	2314318	2314318	966579	115	115	Mistakes
dk	2309516	2323904	14388	11076	54452	Denmark
il	2253613	2271382	17769	25	11953	Israel
gov	2211757	2297286	785529	2291	621385	Government
sg	211575	2147355	16540	1237	928	Singapore
ro	2092000	2103777	54757	2136	162726	Romania
us	1945613	2081685	136072	22928	111087	United States
hr	191583	1913493	1910	1685	42048	Croatia (local name: Hrvatska)
id	1841324	1857116	15792	829	15863	Indonesia
org	1792394	1876134	1836499	225182	1219300	Organizations
uy	1702412	1702412	4264	103	103	Uruguay
lt	1712866	1721963	3697	3802	308420	Lithuania
ua	1690856	1617644	125888	2211	153065	Ukraine
mil	1556744	2663038	1106292	171	272964	US Military
ie	1329458	1333473	4015	7781	228325	Ireland
ir	131519	131519	1643	1485	1234340	Iran (Islamic Republic Of)
ve	1309462	1309462	3089	23	23	Venezuela
kz	1201033	1228464	27431	2963	721391	Kazakhstan
ec	1054535	1056535	2000	2633	156544	Ecuador
rs	1037518	1040008	2488	1832	49706	
sk	997187	998901	4114	6238	225328	Slovakia (Slovak Republic)
py	931338	931338	56055	60	20	Paraguay
unknown	779630	13819528	130398898	306205	423649	Unknown
bg	777130	847227	70097	2276	209383	Bulgaria
hk	715546	829738	114192	1159	43712	Hong Kong
do	667607	706812	39205	205	802	Dominican Republic
eu	648700	650000	2814	30324	45248	European Union
ee	611170	613172	2002	2447	58297	Estonia
one	580039	580326	287	427	490	

## Top-level Domains (TLDs) Overview

For the day of December 28, 2019

TLD	New	Deleted	Transferred	Current Total
.COM	106,845	111,018	148,201	145,379,497
.NET	5,891	11,697	8,475	13,286,468
.ORG	4,804	5,042	4,525	10,090,564
.INFO	3,231	3,264	4,187	4,661,629
.BIZ	930	3,036	866	1,617,678
.US	322	1,112	481	1,766,407
<b>TOTALS</b>	<b>122,023</b>	<b>135,169</b>	<b>166,735</b>	<b>176,802,243</b>

Above shows 145 million .com sites out  
Of a total 176 million; see  
<http://www.dailychanges.com>

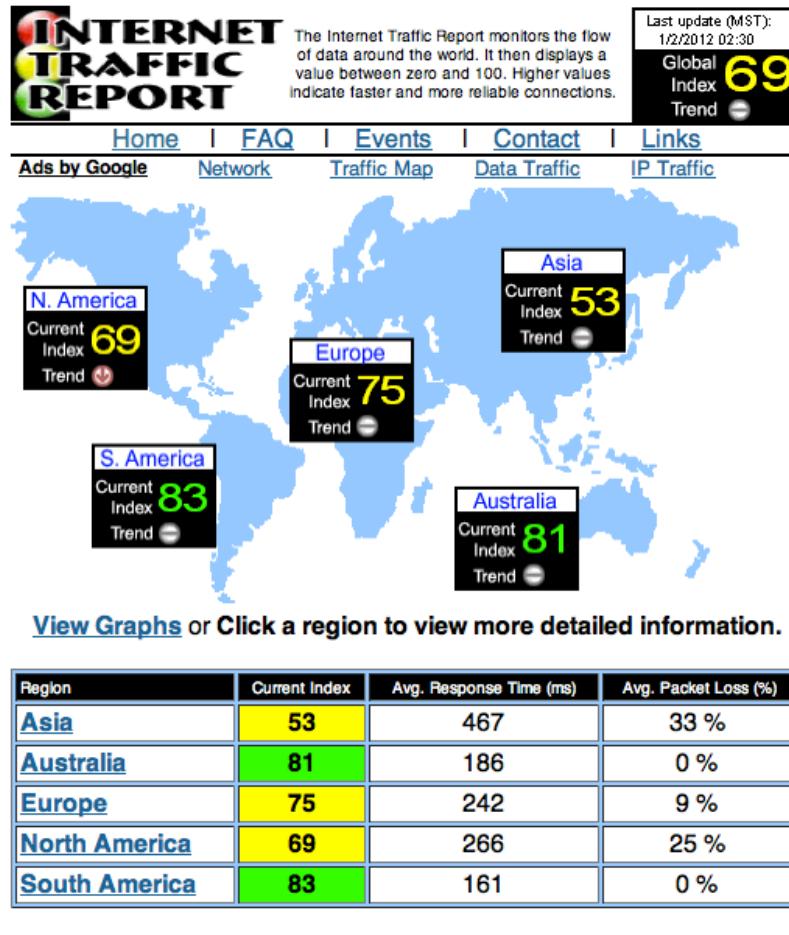
Try also:

<http://research.domaintools.com/statistics/tld-counts/>

**Conclusion:** the .net and .com categories are the largest followed by Japan, Germany and Brazil

# Internet Traffic

- How efficiently is the Internet working now
  - <http://www.internettrafficreport.com>

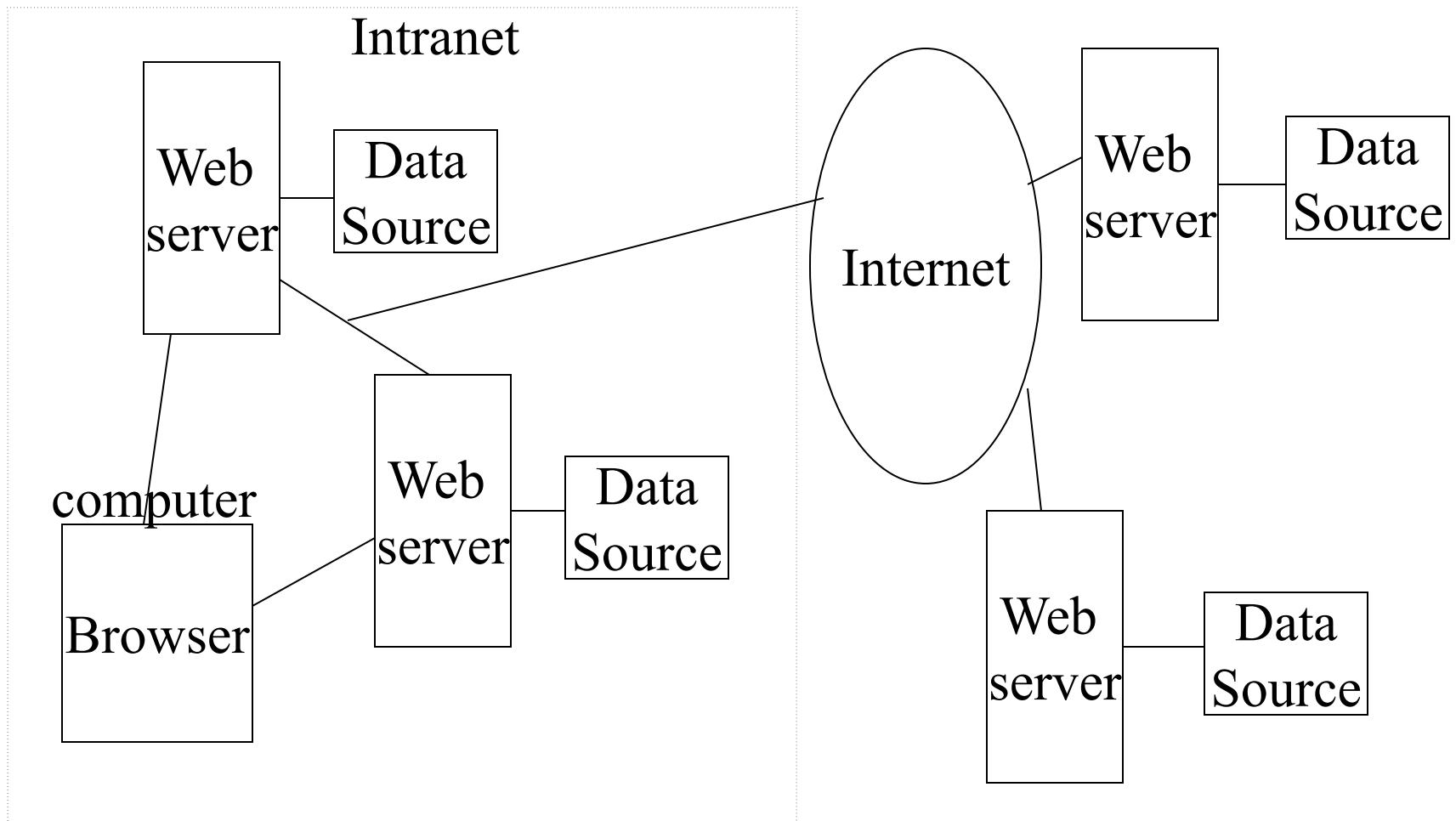


*Data  
from  
January  
2012*

## **Defining the World Wide Web**

- A wide-area hypertext, multimedia information retrieval system that provides access to a large universe of documents
- A uniform way of accessing and viewing some information on the Internet
- The WWW
  - creates a world in which information has a reference by which it can be accessed
  - subsumes the capabilities of ftp, gopher, wais and news

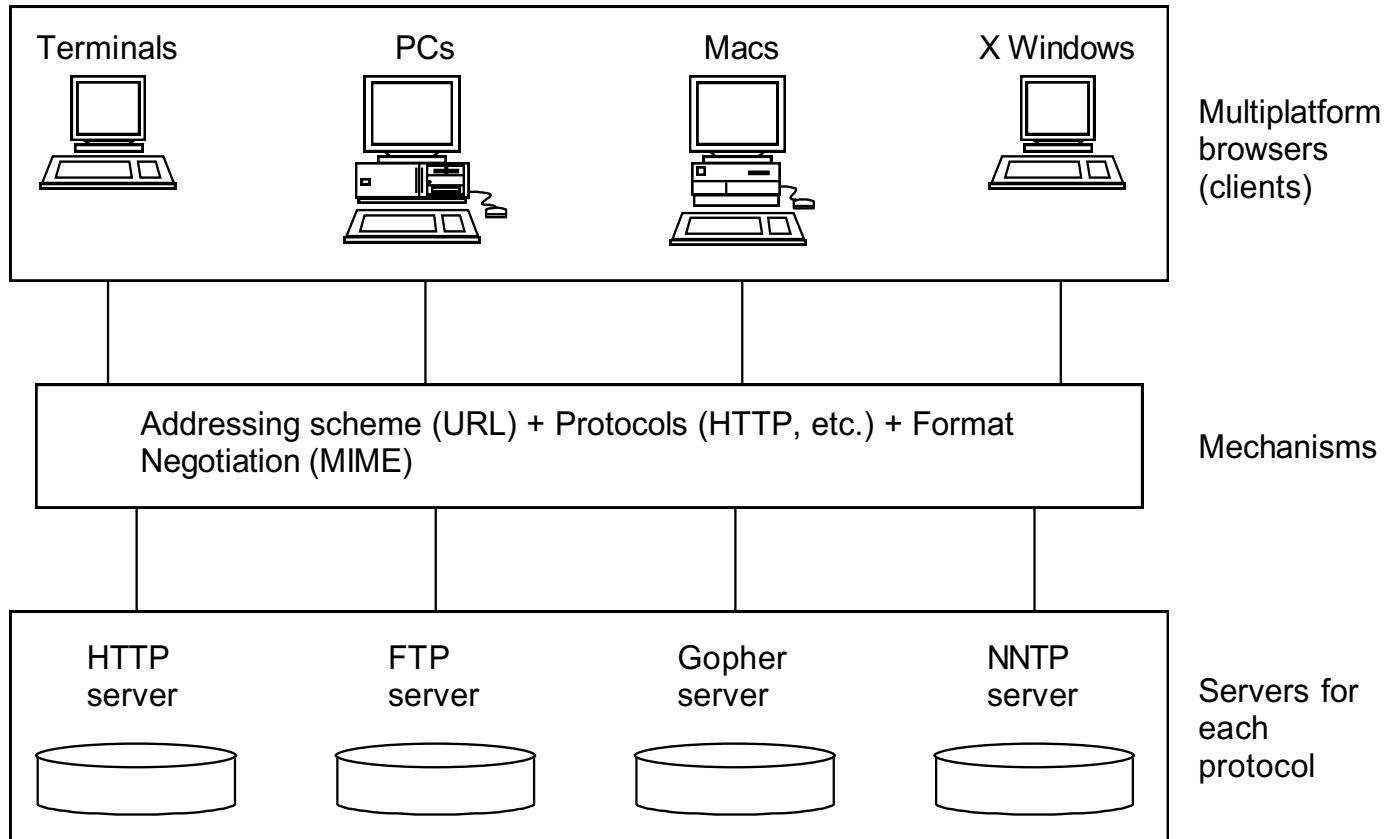
# Graphical View of the WWW



# **Major Technology Components**

- **Client/server architecture**
  - where client programs interact with web servers
- **Network protocol**
  - HTTP, Hypertext Transfer Protocol, is the language understood by browsers and web servers
  - designed to move quickly from document to document
- **Addressing system** (Uniform Resource Locators)
  - `http://domain/directory/file.html`
- **Markup Language**
  - every web server understands and every browser displays
  - includes support for HyperText and multimedia

# Client/Server Architecture Model



## The WWW Server

- Web browsers and Web servers communicate according to a protocol known as HTTP (HyperText Transfer Protocol)
  - The current HTTP protocol is version 1.1
- The Web server is a software system running on a machine often called the Web server, don't confuse them
- A web server can
  - receive and reply to HTTP requests
  - retrieve documents from specified directories
  - run programs in specified directories
  - handle limited forms of security
- A web server does not
  - know about the contents of a document, links in a document, images in a document or whether a particular file, e.g. a \*.gif file, is in the correct format

# **Uniform Resource Locator (URL)**

- A mechanism whereby an Internet resource can be specified in a single line of ASCII text
- See RFC 1738: <http://www.faqs.org/rfcs/rfc1738.html>

## **URL**

## **Refers to:**

`file://pub/xt.ps`

a PostScript file in directory pub on your local machine

`ftp://usc.edu/docs/sweng.txt`

file sweng.txt in directory docs on usc.edu, an anonymous ftp site

`http://nunki.usc.edu/mydocs/book.doc`

a file in directory mydocs on machine nunki.usc.edu, a WWW site

`news:comp.compilers`

the newsgroup computers.compilers

`mailto:horowitz@usc.edu`

an e-mail address

# General Description of a URL

1. **Scheme** followed by a colon

http:, ftp:, gopher:, news:, mailto:, wais:, telnet:

2. **Double slash** (only for http, ftp, gopher, wais) //

3. Internet **domain** name e.g., pollux.usc.edu

4. **Port** number (this field is optional; e.g., pollux.usc.edu:8081)

Standard or default port numbers:

--- ftp is 21 gopher is 70

--- telnet is 23 http is 80

--- smtp is 25 nntp is 119

--- imap is 143 secure nntp is 563

--- pop3 is 110 secure pop3 is 995

5. **Path** e.g., /pub/docs

# URL Character Set

- RFC 1738, Dec. 1994 defines the URL character set as  
"...Only alphanumerics [0-9a-zA-Z], the special characters "\$-\_.+!\*'()", **[not including the quotes]**, and reserved characters used for their reserved purposes may be used unencoded within a URL."
- However, HTML supports ISO-8859-1 (ISO-Latin) character set
  - HTML 4.x extends the character set to all of Unicode
- Therefore, in URLs an escape mechanism is used, % followed by two hex digits
- Characters that should be encoded include:  
%, /, ., . ., #, ?, :, \$, +, @, &, =
- Here are some encoded values for so-called “unsafe” characters

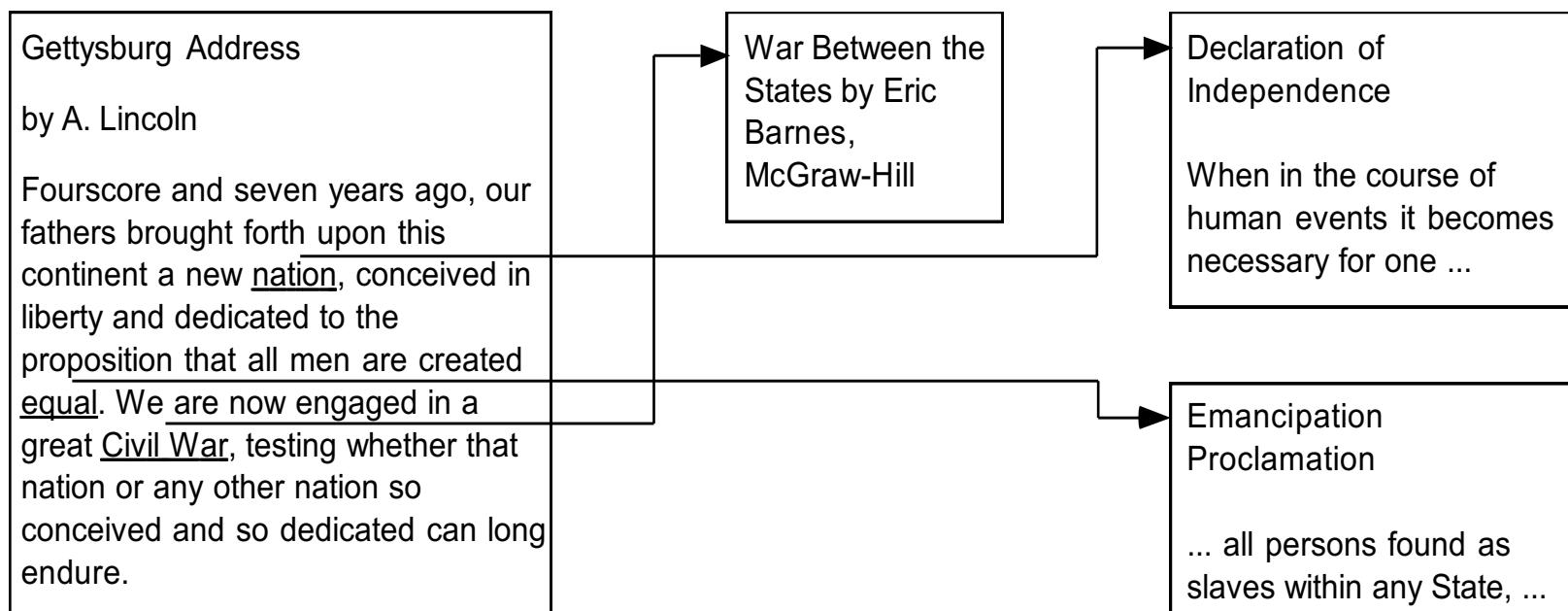
~	%7E		%7C
SPACE	%20	\	%5C
%	%25	^	%5E
&	%26	[	%5B
=	%3D	]	%5D
?	%3F	#	%23
{	%7B	>	%3E
}	%7D	<	%3C

# **Markup Languages**

- HTML - hypertext markup language, specifies document layout and the specification of hypertext links to text, graphics and other types of objects
- Browsers display text and graphics using the markup as guidance
- However, HTML is *not* like a word processing program, e.g. Microsoft Word or WordPerfect, and *not* like a page description languages, e.g. postscript
  - as a result, translation into HTML can produce a result that does not look exactly like the original

# What is HyperText?

- Regular text, with the additional feature of links to related documents
- As you read documents and follow links, you traverse a “web” of interconnections

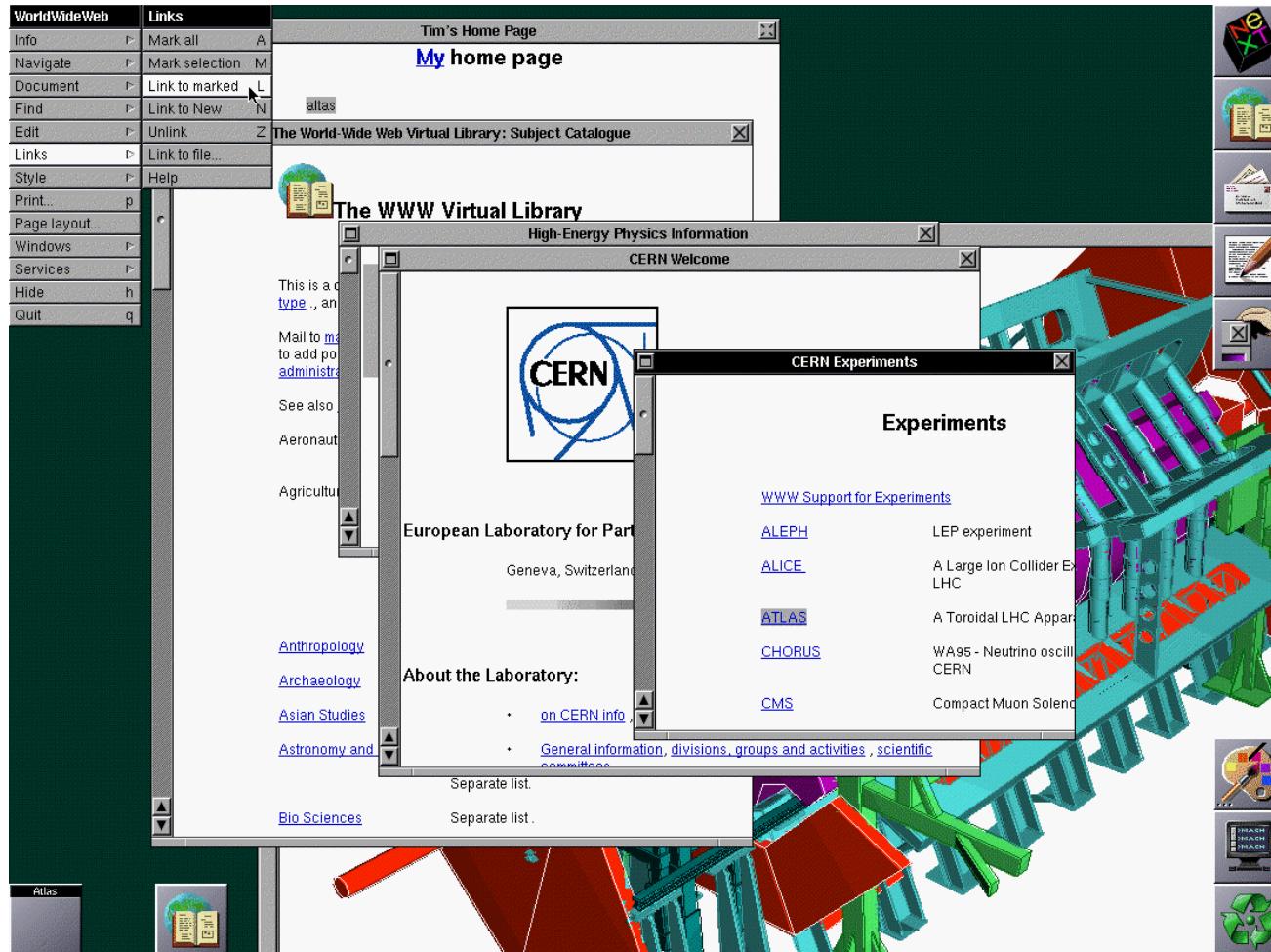


# **Early History of the WWW**

- 1989-1990 Tim Berners-Lee conceives the WWW at CERN in Geneva
- 1990 Berners-Lee releases WWW prototype on NeXT computer
- 1992 Release of source code for line mode browser,  
lynx and HTTP
- 1993 Mosaic browser from NCSA is released
- 1993 WWW internet traffic now measures 1% of NSF backbone
- 12/94 Netscape Navigator 1.0 is released  
World Wide Web Consortium formed
- 1995 Microsoft Windows 95 and Internet Explorer 1.0 released
- 1995 Java is released
- 1998 Google is started
- 1999-2001 A burst of Internet start-up companies which flamed out because they were not profitable. Also known as the "Internet Bubble."
- 2004 Firefox 1.0 is released
- 2005 YouTube is founded
- 2008 Google Chrome 1.0 is released

# First Web Communication (Dec 1990)

See <http://www.w3.org/History.html> and tim Berners-Lee's presentation at the 10<sup>th</sup> anniversary, <http://www.w3.org/2004/Talks/w3c10-HowItAllStarted/?n=1>



# Original WWW “The Project” site at CERN

<http://info.cern.ch/hypertext/WWW/TheProject.html>

The screenshot shows a web browser window with the title "The World Wide Web project". The address bar displays the URL "info.cern.ch/hypertext/WWW/TheProject.html". The main content area features a large heading "World Wide Web". Below it, a paragraph explains that the WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents. It mentions that everything online about W3 is linked directly or indirectly to this document, including an [executive summary](#), [Mailing lists](#), [Policy](#), November's [W3 news](#), and [Frequently Asked Questions](#). The page also lists various links such as "What's out there?", "Help", "Software Products", "Technical", "Bibliography", "People", "History", "How can I help?", and "Getting code".

The World Wide Web

The WorldWideWeb (W3) is a wide-area [hypermedia](#) information retrieval initiative aiming to give universal access to a large universe of documents.

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[What's out there?](#)  
Pointers to the world's online information, [subjects](#) , [W3 servers](#), etc.

[Help](#)  
on the browser you are using

[Software Products](#)  
A list of W3 project components and their current state. (e.g. [Line Mode](#) ,X11 [Viola](#) , [NeXTStep](#) , [Servers](#) , [Tools](#) , [Mail robot](#) , [Library](#))

[Technical](#)  
Details of protocols, formats, program internals etc

[Bibliography](#)  
Paper documentation on W3 and references.

[People](#)  
A list of some people involved in the project.

[History](#)  
A summary of the history of the project.

[How can I help?](#)  
If you would like to support the web..

[Getting code](#)  
Getting the code by [anonymous FTP](#) , etc.

# London Olympics (July 2012)

See <http://www.zdnet.com/article/web-inventor-tim-berners-lee-stars-in-olympics-opening-ceremony/>

<https://www.youtube.com/watch?v=KW6ivwDcOY4>



*Sir Tim Berners-Lee live-tweets during the 2012 Olympics opening ceremony, with a NeXT Cube by his side*

## **WWW Consortium**

- Founded in 1994, headed by Tim Berners-Lee,  
<http://www.w3.org>
- Goal: “to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability.”
- Many of the technologies guided by the WWW consortium will be discussed this semester:
  - HTML, Style Sheets, Document Object Model, international character sets, HTTP, XML, etc.