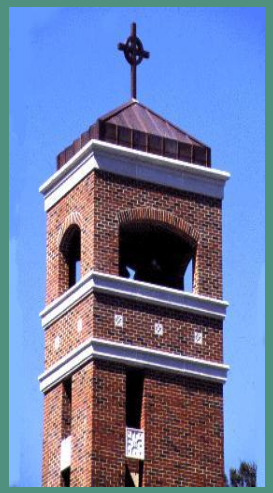


Introduction to MIS

Internet, Intranets, Extranets

Learning Objectives

- Describe the makeup of the Internet and the World Wide Web
- Discuss navigational tools, search engines, and directories
- Describe common Internet services
- Summarize widely used Web applications
- Explain the purpose of intranets
- Explain the purpose of extranets
- Summarize the trends of the Web 2.0 and Web 3.0 eras and Internet2
- Describe the Internet of Everything

- What the difference between the Internet and the World Wide Web (WWW) ?

Wait….

?

Don’t look ahead, until you have your answer !

The Internet

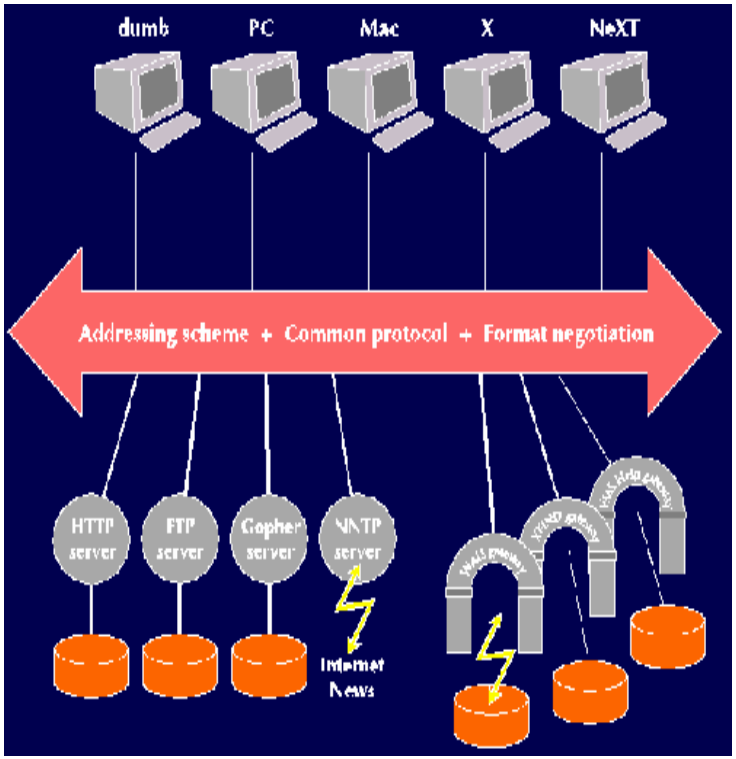
- Internet: worldwide collection of millions of computers and networks of all sizes
  - Network of networks
  - Started in 1969 as a project by the U.S. Department of Defense called Advanced Research Projects Agency Network (ARPANET)
  - Evolved into the National Science Foundation Network (NSFNET) in 1987

The World Wide Web

- The World Wide Web (i.e., WWW or the Web) changed the Internet in 1989
  - Applications running on the Internet using HTTP protocol
  - Organizes information by using hypermedia
    - Documents include embedded references to audio, text, images, video, and other documents
    - Hypertext: embedded references in hypermedia documents
  - Introduced a graphical interface to text-based Internet (1995) via HTML

WWW (con't)

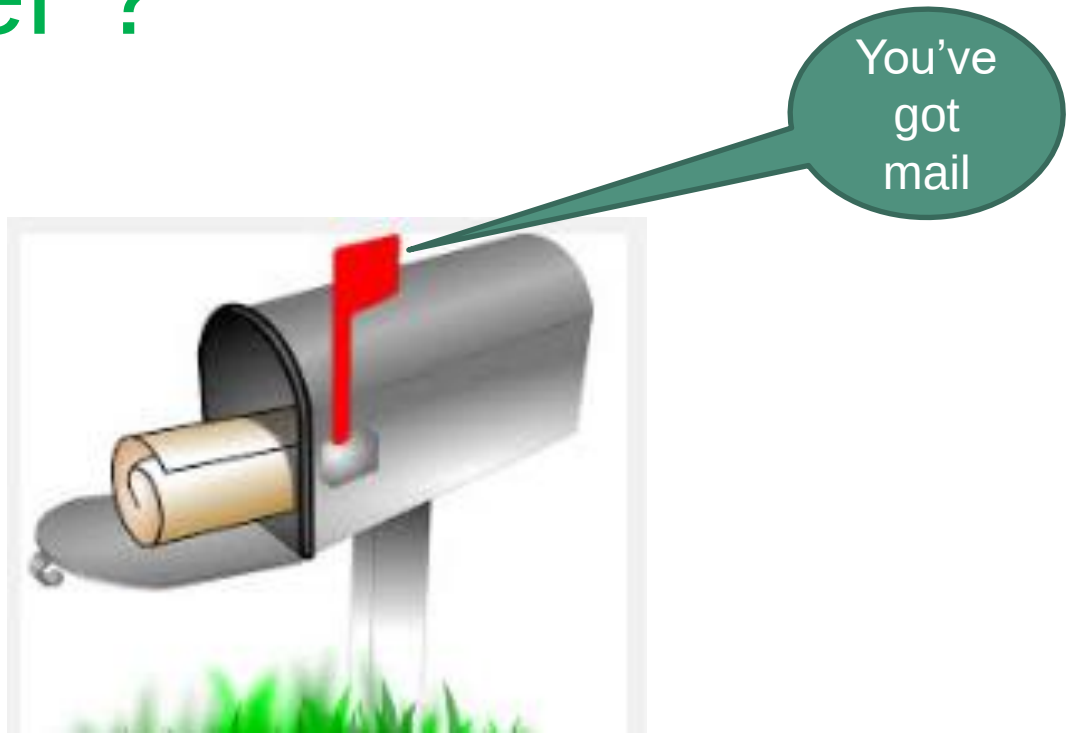
- **Webmaster** the person in charge of the organization's *Web site*
- **Uniform resource locator (URL)** points to an address of a specific resource on the Web
  - Domains
- **Hypertext transport protocol (HTTP)** is the communications standard used to transport pages across the Web portion of the Internet



Common Top Level Domains

gLTD	Purpose
.com	Commercial organizations (such as Microsoft)
.edu	Educational institutions (such as California State University)
.int	International organizations (such as the United Nations)
.mil	U.S. military organizations (such as the U.S. Army)
.gov	U.S. government organizations (such as the Internal Revenue Service)
.net	Backbone, regional, and commercial networks (e.g., the National Science Foundation's Internet Network Information Center)
.org	Other organizations, such as research and nonprofit organizations (e.g., the Internet Town Hall)

- What makes up a traditional postal letter ?



Wait….

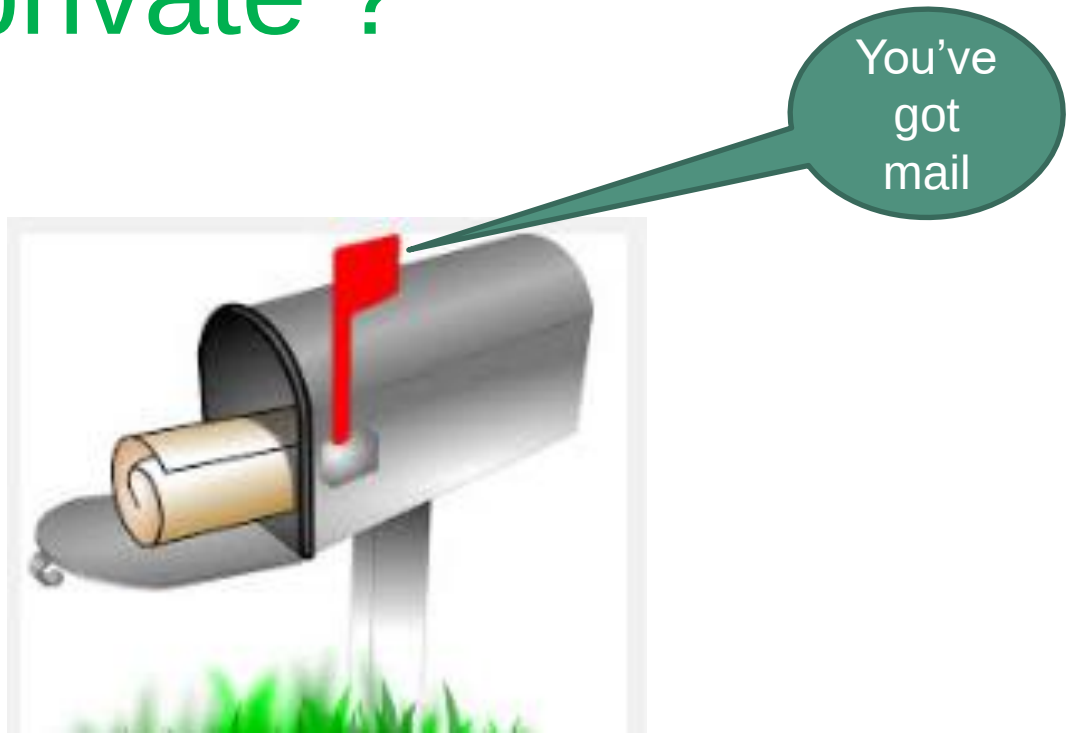
?

Don’t look ahead, until you have your answer !

Traditional Postal Letter

- Receiver address
- Sender address
- Date/time stamp
- Message (inside of the envelope)
- Optionally: return receipt

- What parts are public, what parts are private ?



Wait….

?

Don’t look ahead, until you have your answer !

Traditional Postal Letter (con't)

- Public (communications "metadata")
  - Receiver address
  - Sender address
  - Date/time stamp
- Private:
  - Message (inside of the envelope)
  - Optionally: return receipt

- What makes up an email message ?

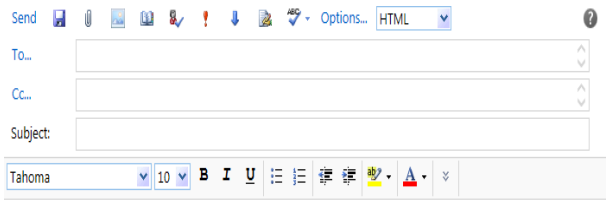
Wait….

?

Don’t look ahead, until you have your answer !

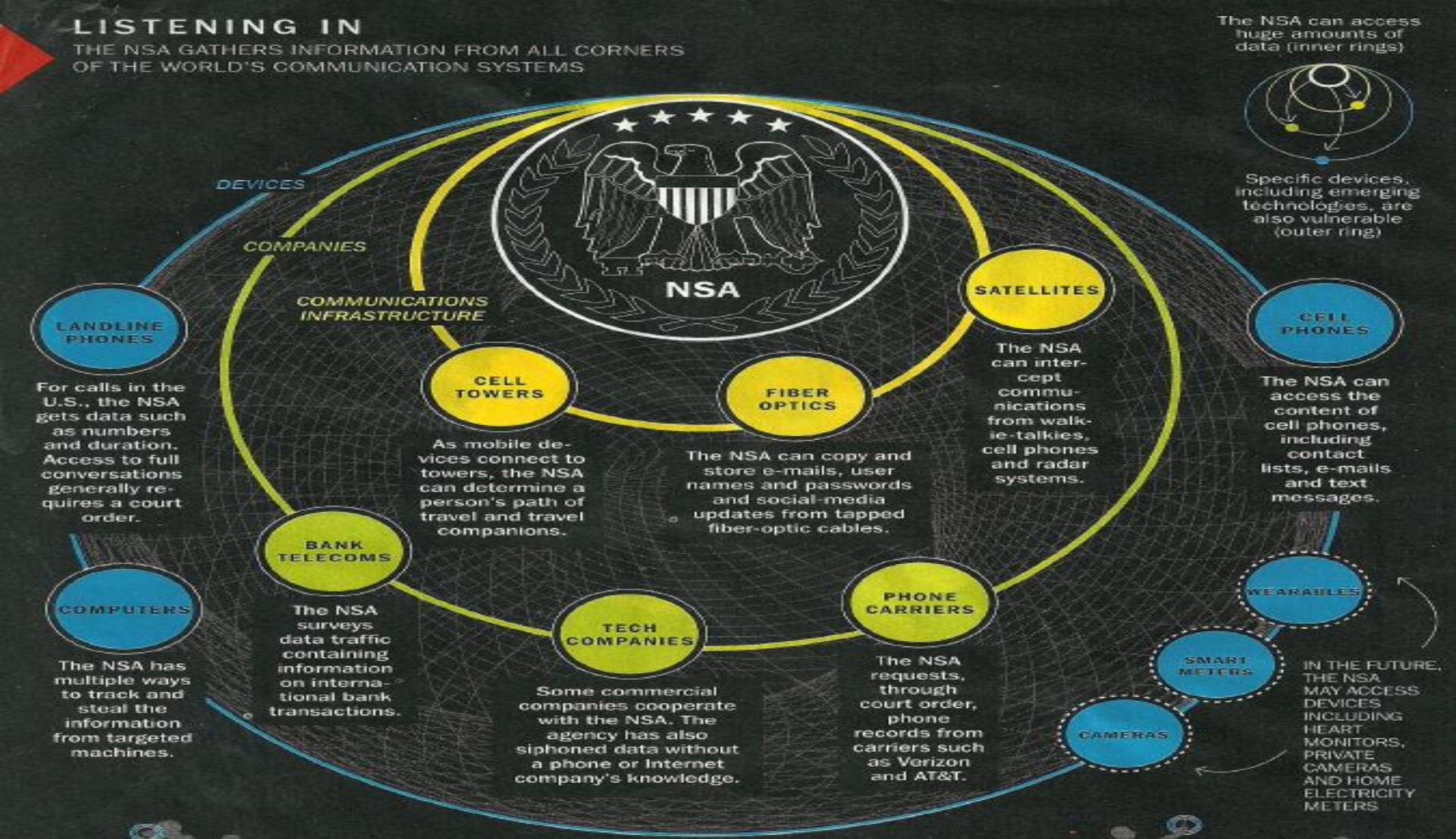
Email Message

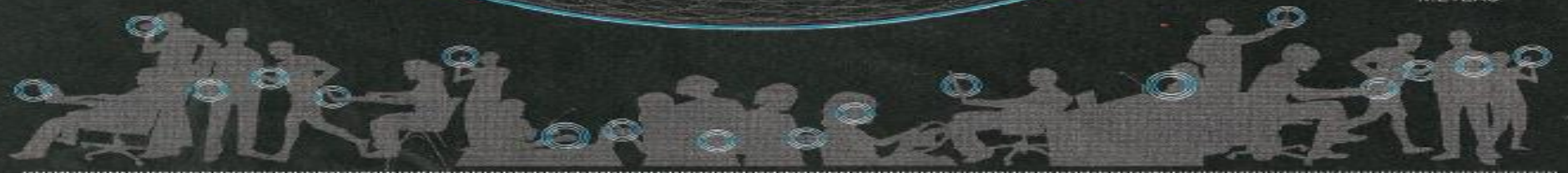
- Public (metadata):
  - Receiver email address
  - Sender email address
  - Cc & bcc
  - Subject
  - Date/time
  - Servers involved
- Private:
  - Message



LISTENING IN

THE NSA GATHERS INFORMATION FROM ALL CORNERS OF THE WORLD'S COMMUNICATION SYSTEMS





NOTABLE NSA SURVEILLANCE PROGRAMS

PRISM
Requests information on foreign intelligence targets from American technology

MAINWAY
Requests U.S. telecom companies to hand over call records, which are then stored in databases

FAIRVIEW, BLARNEY, OAKSTAR AND STORMBREW
Gather communications that move along

BULLRUN
Decodes encrypted messages to defeat network security

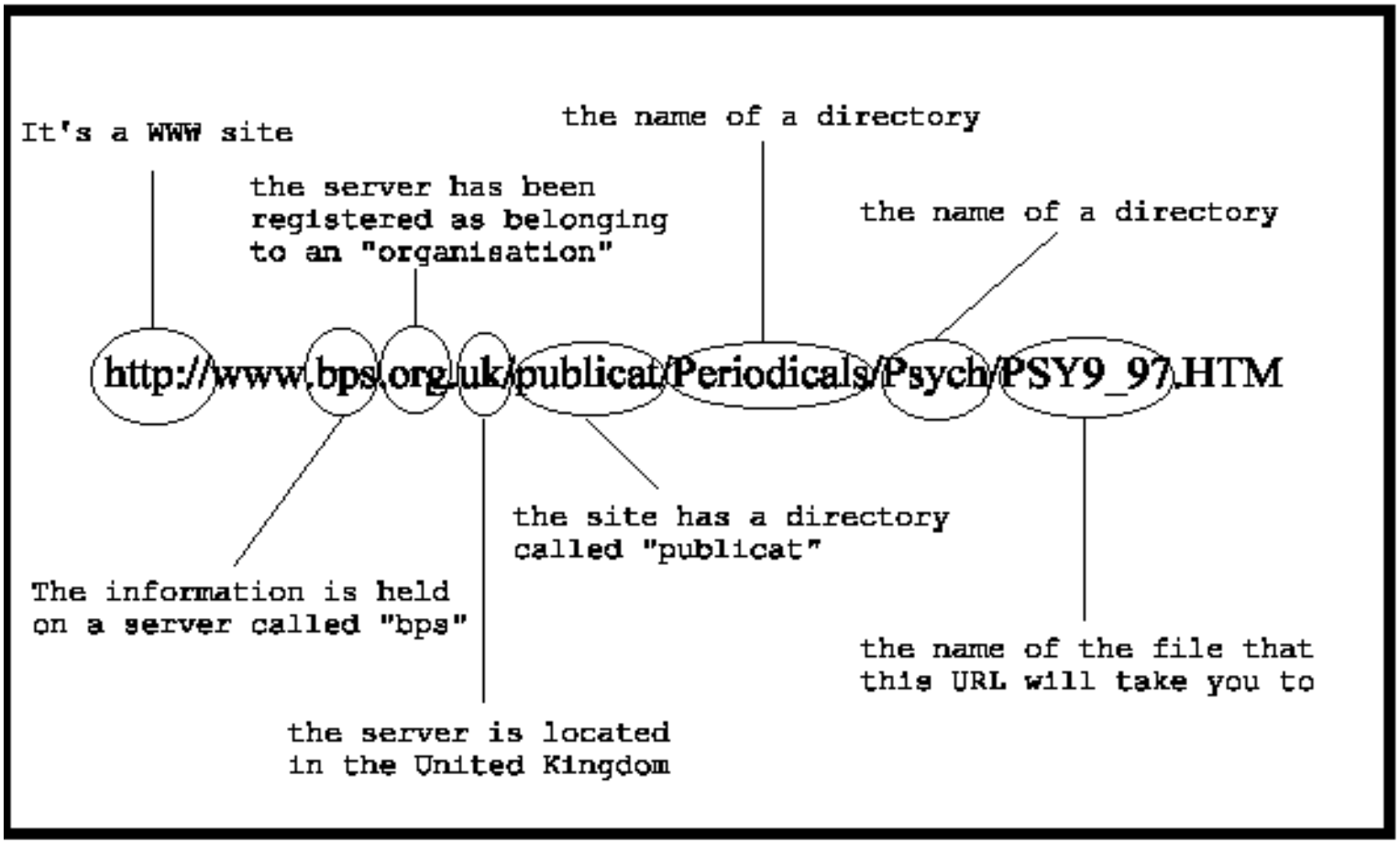
XKEYSCORE
Filters huge amounts of captured data by specific search terms

TRACFIN
Collects results on money transfers and credit-card transactions

URL

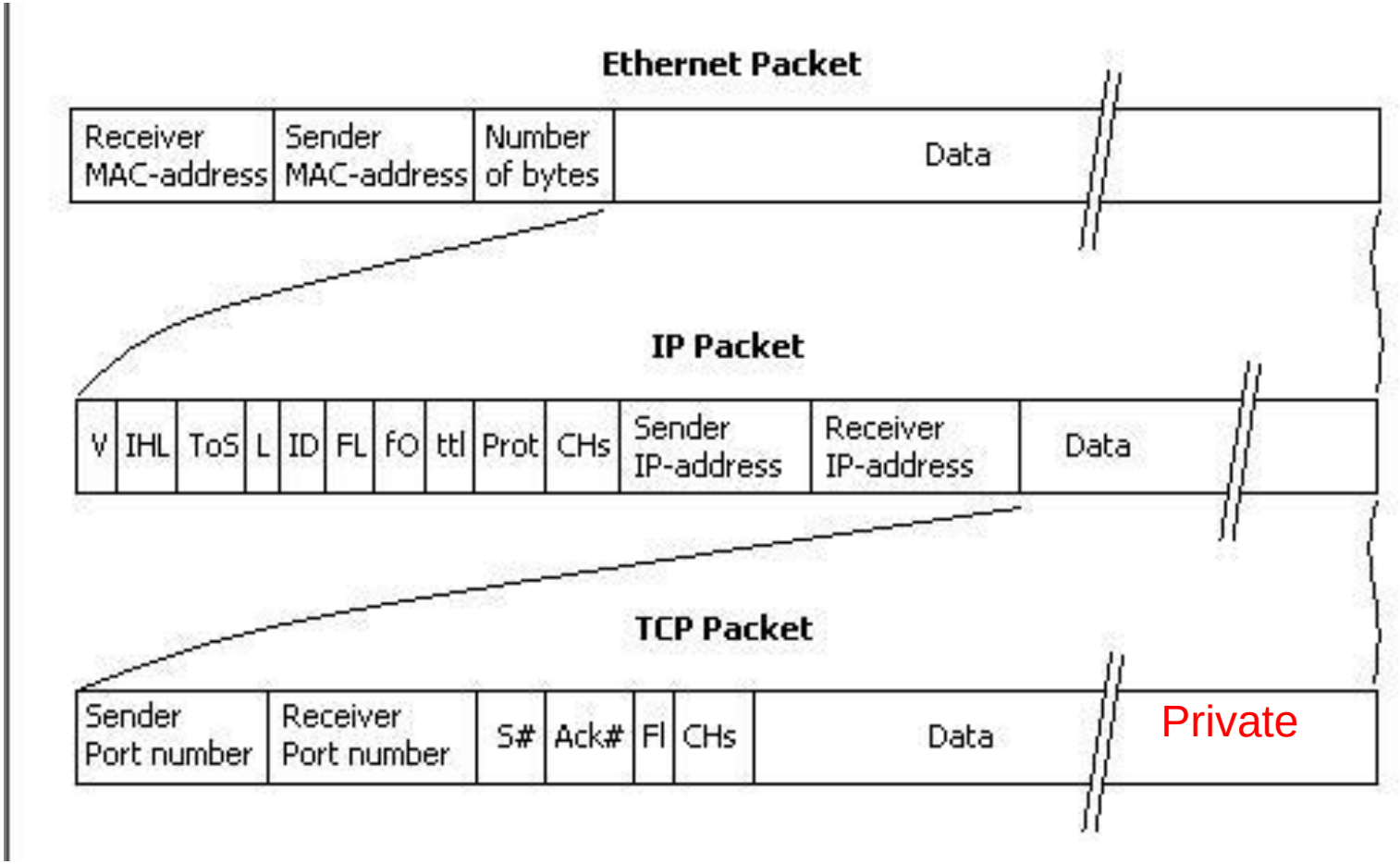
- protocol - a string (ie “http”, ftp, snmp, etc.)
- host - a host domain name (ie. www.cbu.edu)
- port - Unix/NT port number (typically 80 for http)
- path - path to file

URL (con't)


It's a WWW site
the server has been registered as belonging to an "organisation"
the name of a directory
the name of a directory
http://www.bps.org.uk/publicat/Periodicals/Psych/PSY9_97.HTM
The information is held on a server called "bps"
the site has a directory called "publicat"
the server is located in the United Kingdom
the name of the file that this URL will take you to

Internet Packets

[Where is the URL ?]



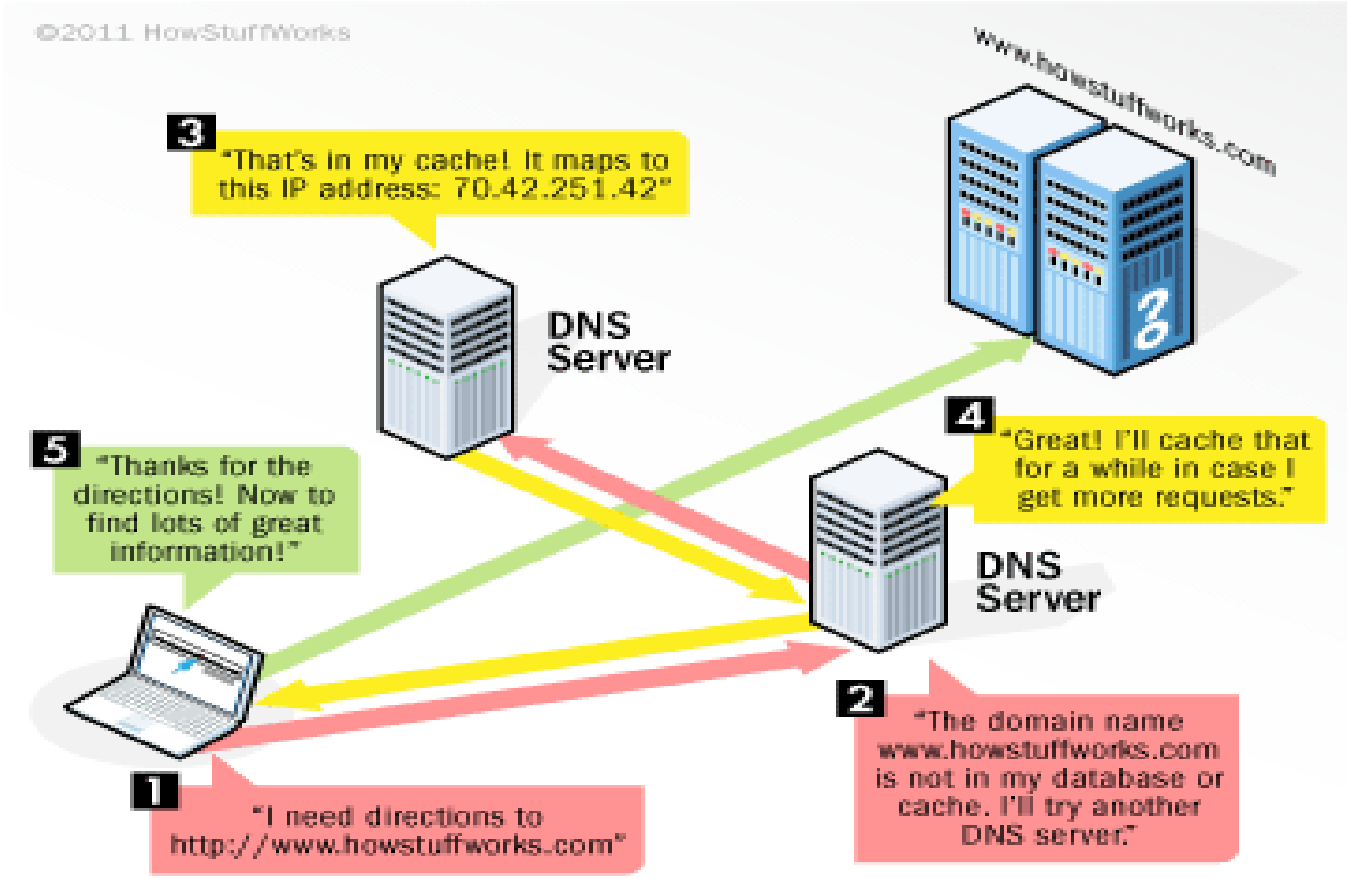
Addresses on the Internet

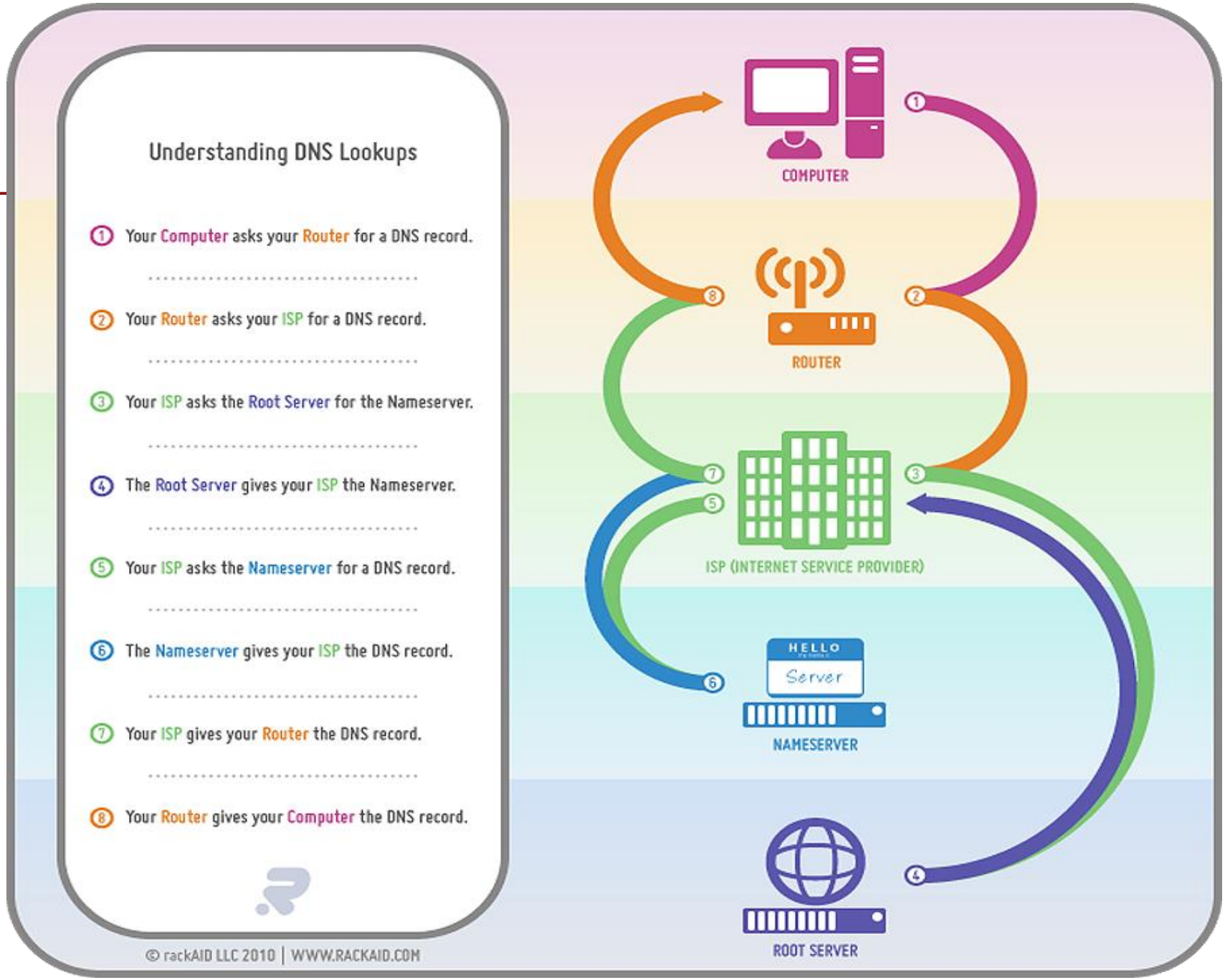
- Each computer (or group of computers) on the Internet has an assigned address, called an **IP address** (i.e. 135.62.128.91)
- **Domain names** consist of multiple parts, separated by dots, which are read from right to left (i.e. www.internic.com)
- **Domain Name System (DNS)**- the naming system correlating names to IP addresses
- DNS and NAT (Network Address Translation) provide conversion back and forth between IP addresses and domain names

Domain Name System

- Hosts on the Internet are usually known not by IP addresses, but by names (e.g., www.wikipedia.org, www.whitehouse.gov, www.freebsd.org, www.cbu.edu)
  - The "dark" web uses just IP addresses
- The routing of IP packets across the Internet is not directed by such names, but by the numeric IP addresses assigned to such domain names
- This requires translating (or resolving) domain names to addresses
- The Domain Name System (DNS) provides such a system for converting names to addresses and addresses to names
- Much like CIDR addressing, the DNS naming is also hierarchical and allows for sub-delegation of name spaces to other DNS servers
- *The domain name system is often described in analogy to the telephone system directory information systems in which subscriber names are translated to telephone numbers*

DNS Simplified

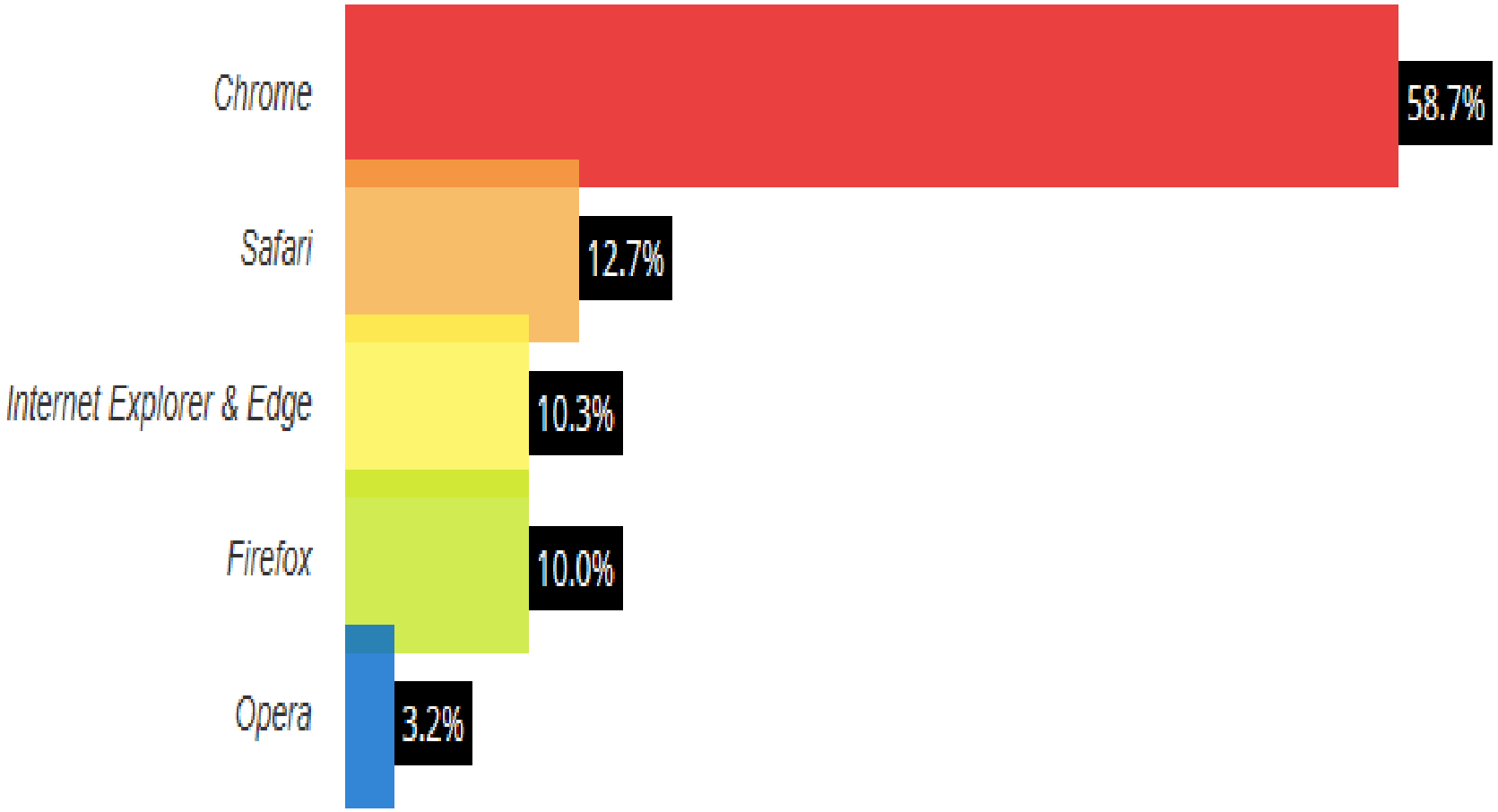



Understanding DNS Lookups
1 Your Computer asks your Router for a DNS record.
2 Your Router asks your ISP for a DNS record.
3 Your ISP asks the Root Server for the Nameserver.
4 The Root Server gives your ISP the Nameserver.
5 Your ISP asks the Nameserver for a DNS record.
6 The Nameserver gives your ISP the DNS record.
7 Your ISP gives your Router the DNS record.
8 Your Router gives your Computer the DNS record.
© rackAID LLC 2010 | WWW.RACKAID.COM
COMPUTER
ROUTER
ISP (INTERNET SERVICE PROVIDER)
HELLO
Server
NAMESERVER
ROOT SERVER

Browsers

- **Browsers** provide a graphical front end that enable users to point-and-click their way across the Web, a process called **surfing**
  - Provide a uniform interface regardless of operating system
  - Current leading browsers are Microsoft's Internet Explorer or Edge, Mozilla's Firefox, Chrome, Opera, and Safari

Worldwide Browser Market Share

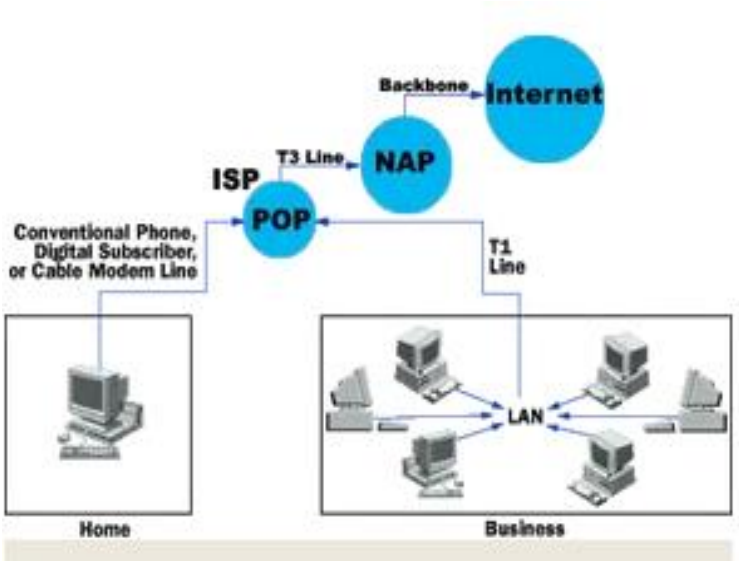


Network of Networks

- Every computer that is connected to the Internet is part of a network, even the one in your home
- At work, you may be part of a **local area network** (LAN), but you most likely still connect to the Internet using an ISP that your company has contracted with
- When you connect to your ISP, you become part of their network; the ISP may then connect to a larger network and become part of their network
- The Internet is simply a network of networks

Network of Networks (con't)

- Most large communications companies have their own dedicated backbones connecting various regions
- In each region, the company has a **Point of Presence** (POP)
- The POP is a place for local users to access the company's network, often through a local phone number or dedicated line
- There is no overall controlling network; instead, there are several high-level networks connecting to each other through **Network Access Points** or NAPs



Intranets

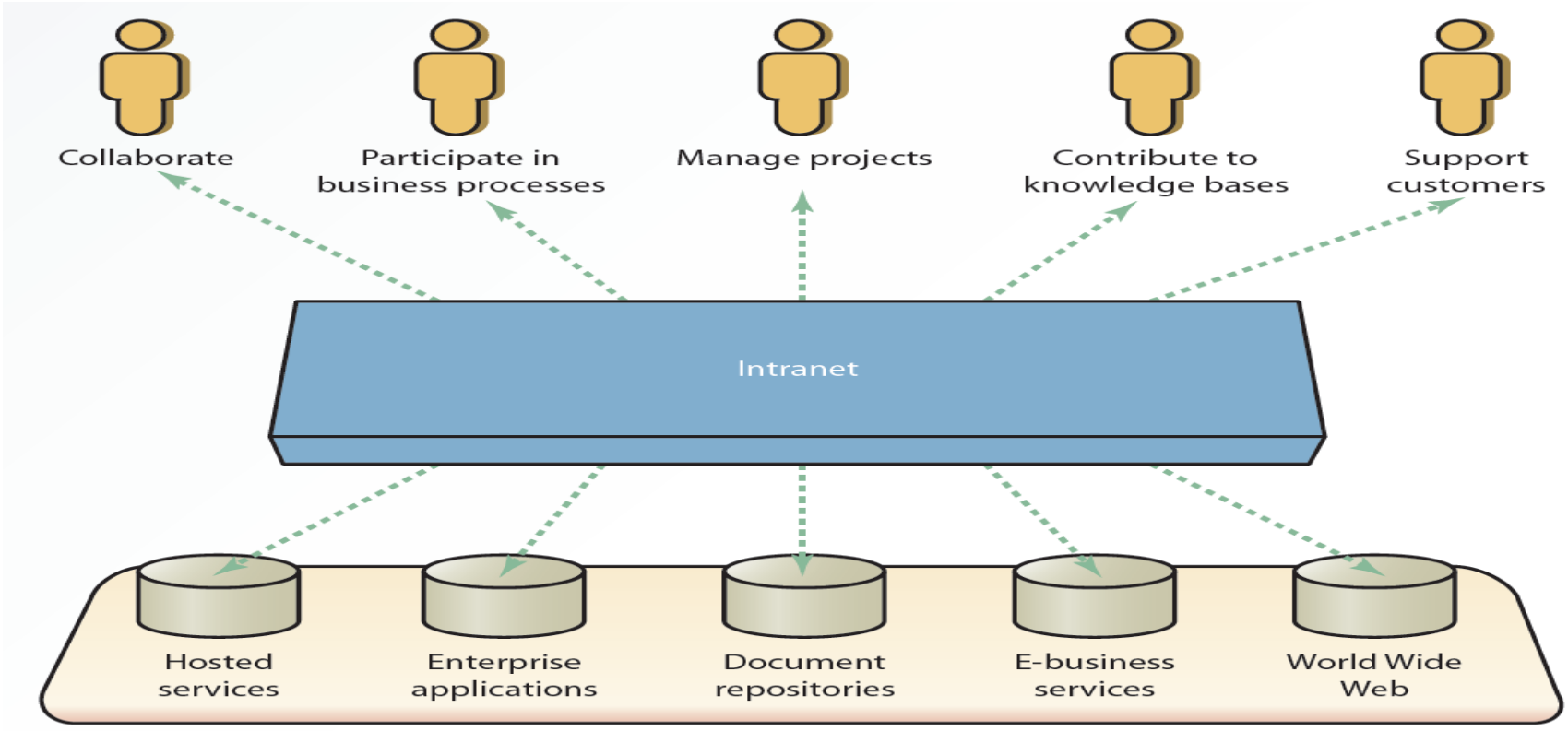
- Network within an organization
  - Uses Internet protocols and technologies for collecting, storing, and disseminating useful information that supports business activities
- Used by employees for internal purposes
  - Companies also allow trusted business partners to access their intranets
- Uses Internet technologies
- Different from a LAN
  - Set up behind a firewall
    - Limiting access is important for security reasons

Intranets (con't)

- Typical intranet applications
  - General corporate private information availability
  - Human resources management
  - Sales and marketing
  - Production and operations
  - Accounting and finance
  - Strategy based on events or needs

Intranets (con't)

At CBU: Intra_WWW folder on information servers



Intranets (con't)

Key Feature	Internet	Intranet
User	Anybody	Approved users only
Geographical scope	Unlimited	Limited or unlimited
Speed	Slower than an intranet	Faster than the Internet
Security	Less than an intranet's	More than the Internet's; user access more restricted

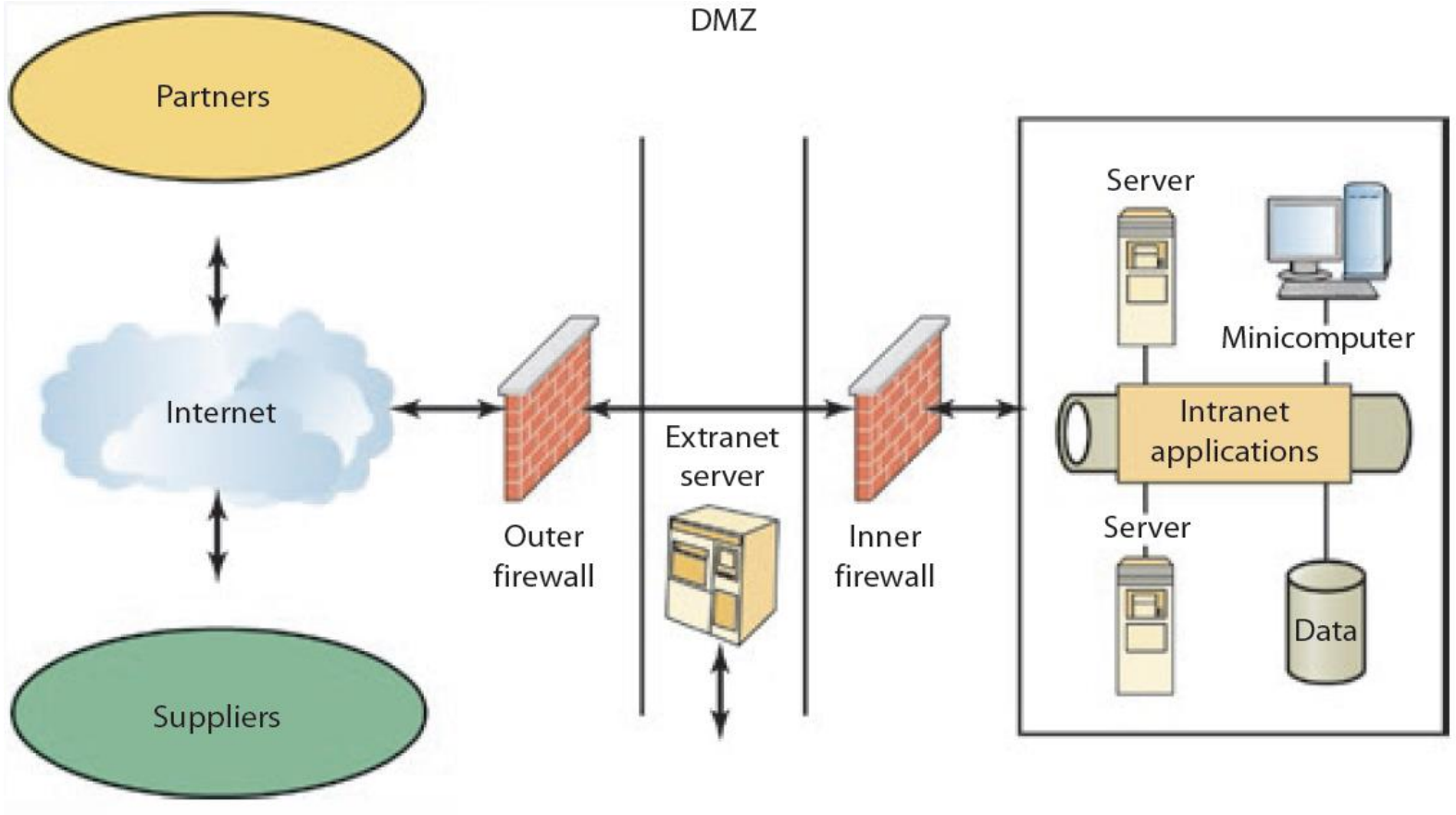
Extranets

- Secure external networks
  - Uses the Internet and Web technologies to connect intranets of business partners
  - Facilitates communication between organizations or between consumers
- Considered to be a type of interorganizational system (IOS)
  - Examples: electronic funds transfer (EFT) and electronic data interchange (EDI)

Extranets (con't)

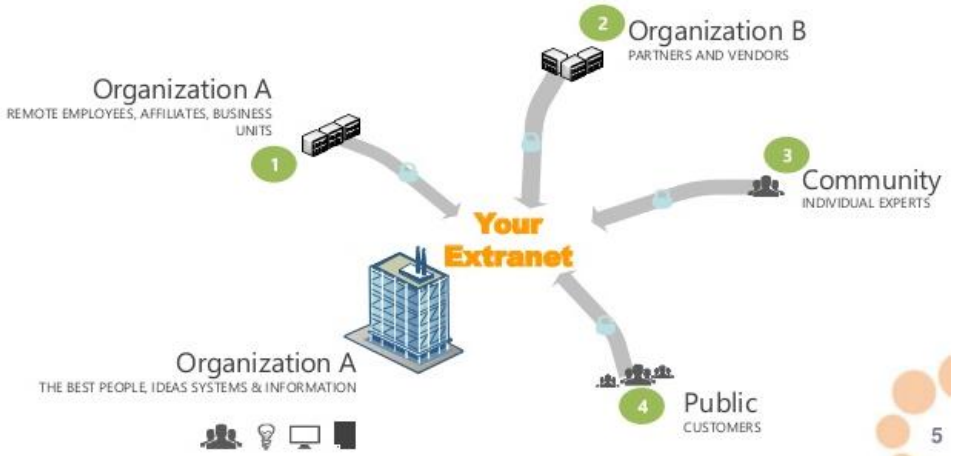
- Typical applications
  - Purchase orders via electronic data interchange (EDI)
  - Allow companies to reduce internetworking costs
  - Provide a competitive advantage that leads to increased profits
  - Require a comprehensive security system and management control

Extranets (con't)



Extranets (con't)

- Advantages
  - Coordination
  - Feedback
  - Consumer satisfaction
  - Cost reduction
  - Expedited communication



Extranets (con’t)

Extranets (con't)

	Internet	Intranet	Extranet
Access	Public	Private	Private
Information	General	Typically confidential	Typically confidential
Users	Everybody	Members of an organization	Groups of closely related companies, users, or organizations

Connecting to the Internet

- Connecting the business to the internet
- Common T1 and T3 services are provided by telecons
- T1 is 1.5Mbps (about $300 to $500 per month)
- A T3 (DS3 - Digital Signal Level 3) is not 3 T1s, but is the bandwidth of 28 T1s bundled together for an approximate speed of 45Mbps (about $3000 to $9000 per month)
- Cable is provided by the cable company and typically falls between 3 and 10 Mbps, and it is the cheapest, about $50/month for slowest speed
- DSL provided by AT&T ranges from 128 Kbps to 3 Mbps (3000 Kbps) and priced similarly to cable (upload and download speeds typically vary)

LAN vs WAN
["telecasm"]

LAN

- Twisted Pair – 100 Mbps (million bits per second)
- Coaxial Cable – 200 Mbps
- Fiber Optic – 6 Tbps (trillion bits per second)

WAN

- T1 - 1.5Mbps
- T3 - 45Mbps
- Cable - typically falls between 3 and 10 Mbps
- DSL – typically ranges from 128 Kbps to 3 Mbps (3000 Kbps)

Fiber vs T1/T3

- These are really two different concepts
- Fiber is a physical data transport medium that can be used to support many applications (i.e. FDDI, ATM, T1/T3, Gigabit Ethernet, etc.)
- T1/T3 are local provider defined services
  - T1 is a leased line with an aggregate speed of 1.54Mbs that can be multiplexed into many channels between locations; T3 is a leased line with an aggregate of 44Mbs that serves a similar function but at a much higher speed and cost

Fiber…

- It is possible that fiber is used by the provider to supply a T1/T3 line, however, this is transparent to the customer
- Fiber is installed by the customer to provide a high speed backbone or campus networks
- Unlike T1/T3, once installed, there are no recurring monthly charges
- The benefits of fiber are: customer-owned, very high speeds, no recurring costs, and the ability to create a seamless network across several buildings
- The disadvantages are: upfront costs, expensive equipment, distance limitations, and the overall cost of labor to connect over long distances

Sonet/OC WAH Connections

- OC is also known as Optical Carrier bandwidth and the term “optical carrier” refers to a broadband network that is based on fiber optics; OC bandwidth is offered in a hierarchy
- **OC-3:** OC-3 is confused with a T3 connection but the two are actually quite different
  - T3 typically utilizes copper wires and a coaxial cable to accommodate the higher data transfer speed as opposed to using telephone wires
  - OC-3 is one of the optic fiber circuit levels that are defined by the Synchronous Optical Network which is also referred to as SONET
  - OC-3 runs at a speed of 155 Mbps where a T3 line runs at 45 Mbps at a cost of about $30,000 to $40,000/month

Sonet/OC (con't)

- **OC-12:** is known as a flexible connection because you can add bandwidth as an organization grows; it operates at a speed of 622 Mbps and is the equivalent of four OC-3 lines
- **OC-48:** is typically used as a backbone for large networks due to its large capacity to accommodate data, voice and video; it is capable of transmitting data at a speed of about 2.50 Gbps (gigabits per second) which is significantly faster than the two previously discussed OC-12 connections (the speed of an OC-48 connection is the equivalent of 48 T3 lines combined)

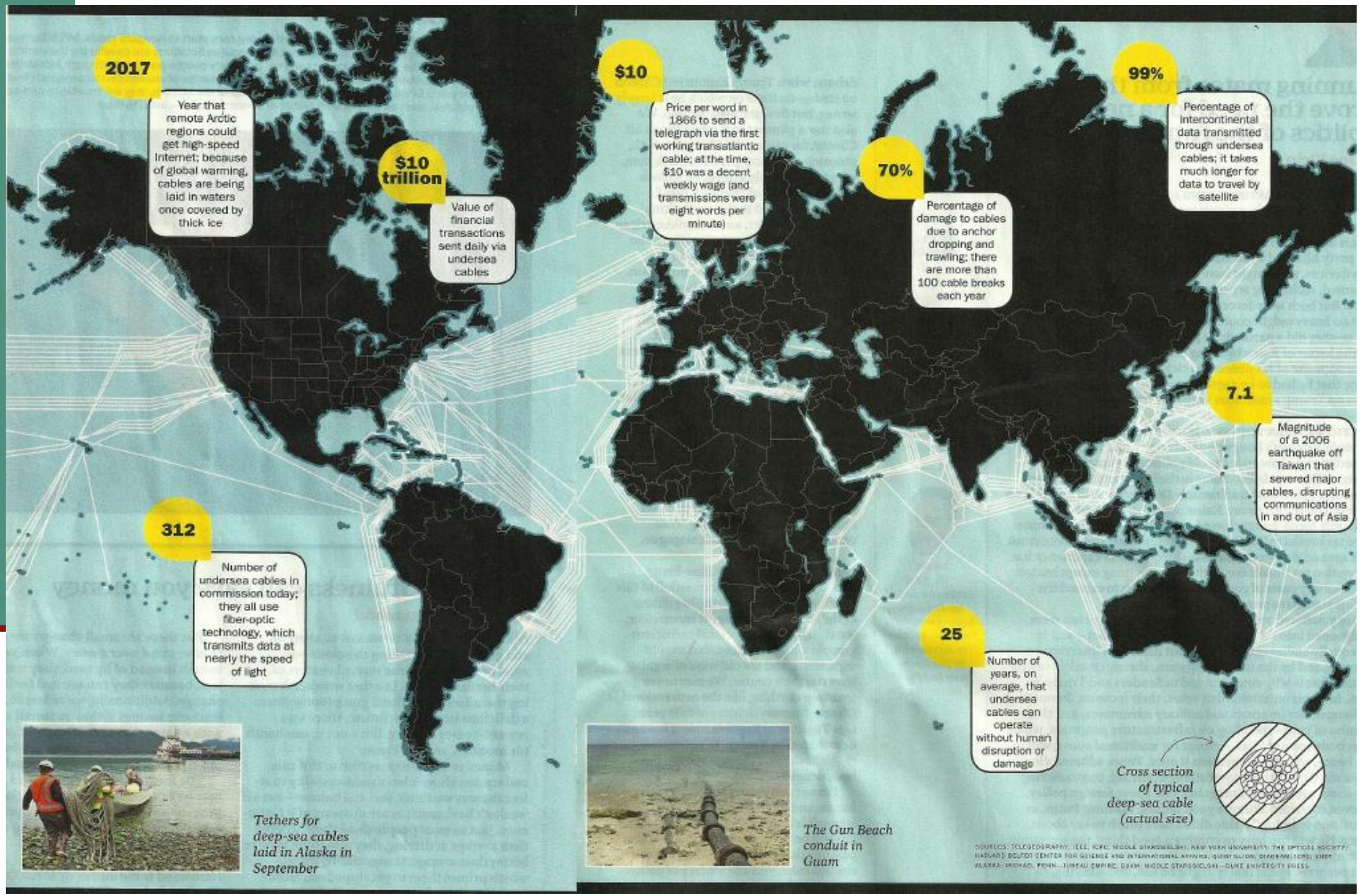
Sonet/OC (con't)

SONET OC Level	SDH Level & Frame Format	Bandwidth
OC-1	STM-0	~52 Mbps
OC-3	STM-1	~156 Mbps
OC-12	STM-4	~622 Mbps
OC-24	–	~1.2 Gbps
OC-48	STM-16	~2.5 Gbps
OC-192	STM-64	~9.6 Gbps
OC-768	STM-256	~38.5 Gbps

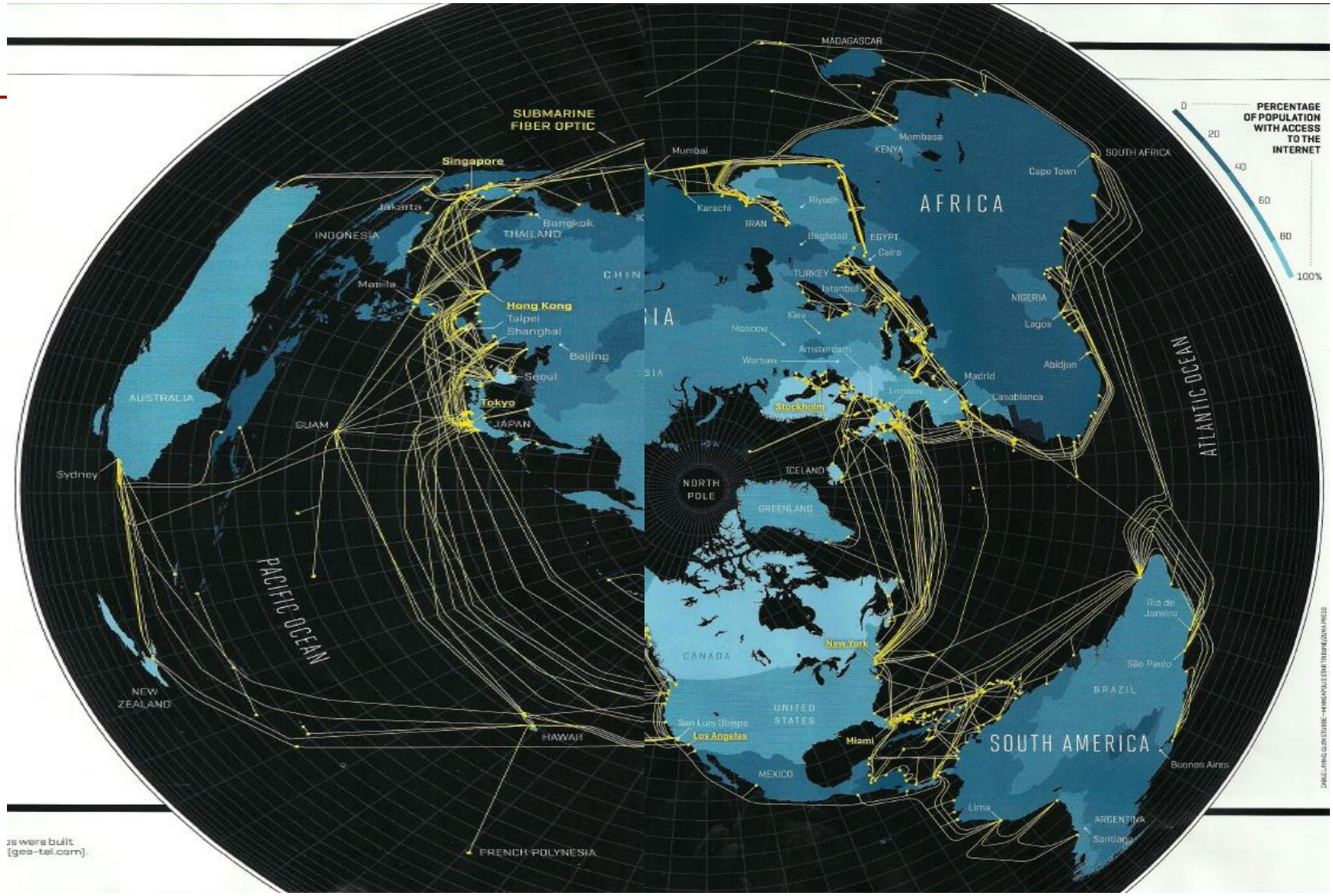
Ocean Fiber Cable

- Some 436 cables, the size of a garden hose, each containing up to 200 glass filaments as thin as a human hair, wrapped in steel armour, insulation and a plastic coat, are in service around the world
- They spinning a fibre-optic web more than 800,000 miles long, down which data is poured at the speed of light
- Together they, not satellites, keep the world connected
- Well over 99 per cent of international telecommunications happens through fibre-optic cables, not satellites

Connecting the World with Fiber

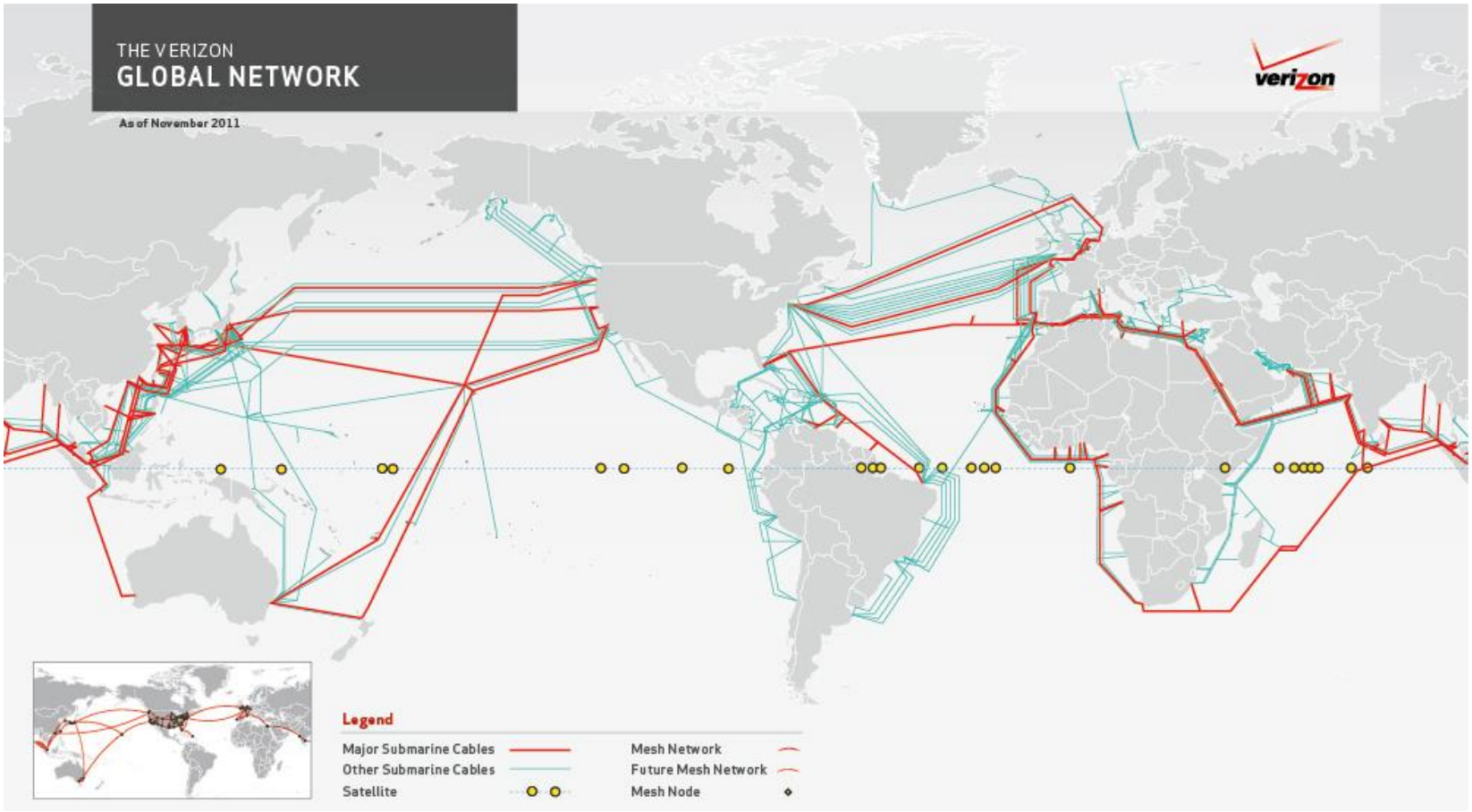


TransOceanic Fiber Cables



Global Verizon Network

[satellite and ocean fiber cable]

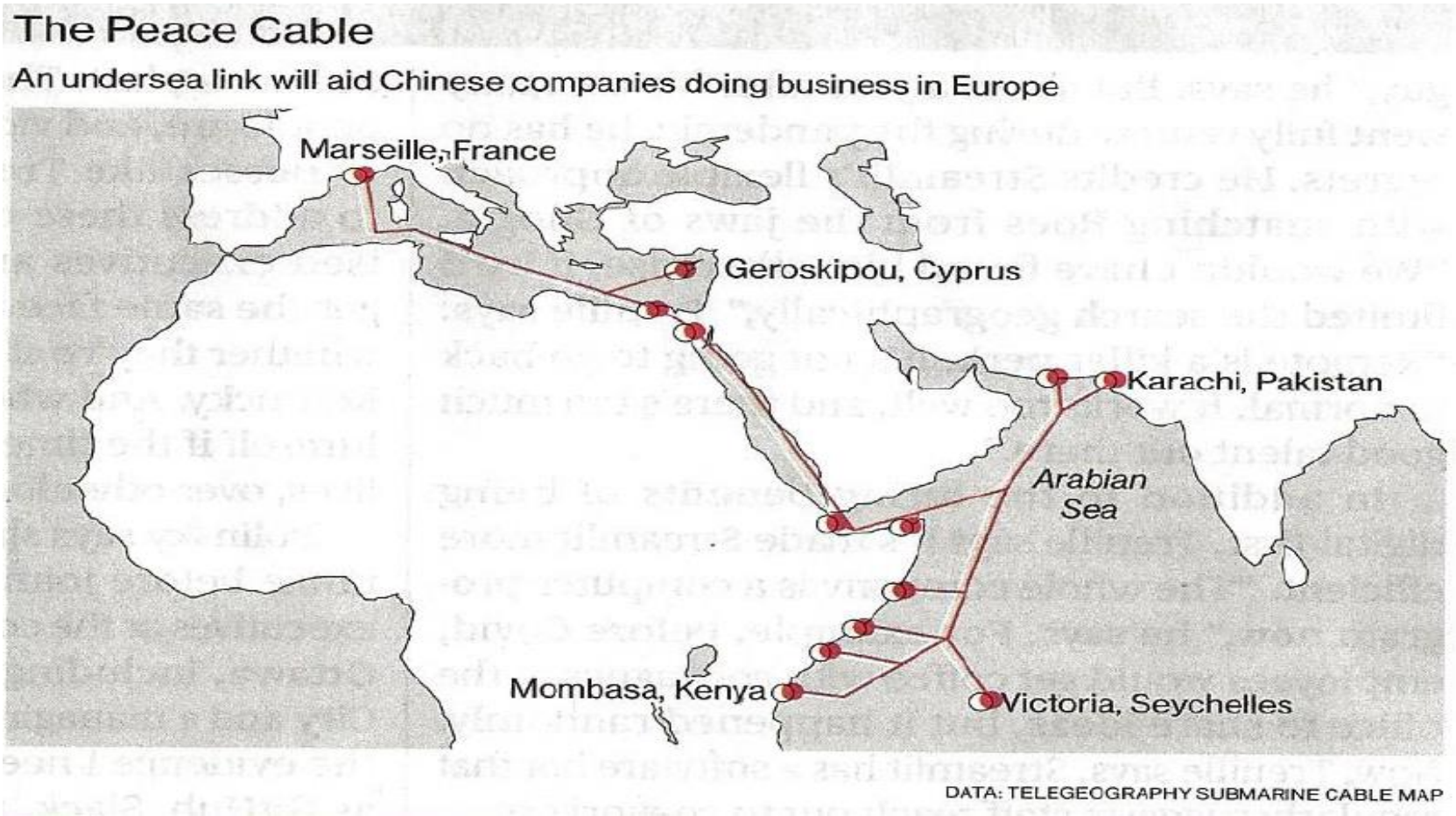


Google Curie Submarine Cable

- The Google Curie submarine cable system is a four-fibre-pair and 10,500km cable connecting Los Angeles, California, and Valparaiso, Chile, with a branching unit for future connectivity to Panama
- The Curie cable system is designed with 18Tbps per fiber pair and a total system design capacity of 72 Tbps

China Now Competing in Global Connectivity Race

- Cable runs overland from China to Pakistan



Internet Telephony

- Using the Internet to exchange spoken conversations
  - Voice over Internet Protocol (VoIP)
    - Requires a high-speed Internet connection and a microphone or headset
    - Used to route traffic starting and ending at conventional public switched telephone network (PSTN) phones
    - Encrypted messages

Internet Telephony (con't)

- Drawback
  - Sometimes a lack of call quality
- Advantages
  - Privacy
  - Absence of busy lines
  - Receiving voicemails on the computer
  - More control, ability to:
    - Screen callers and forward calls from anywhere in the world
    - Direct calls to the correct departments and take automated orders

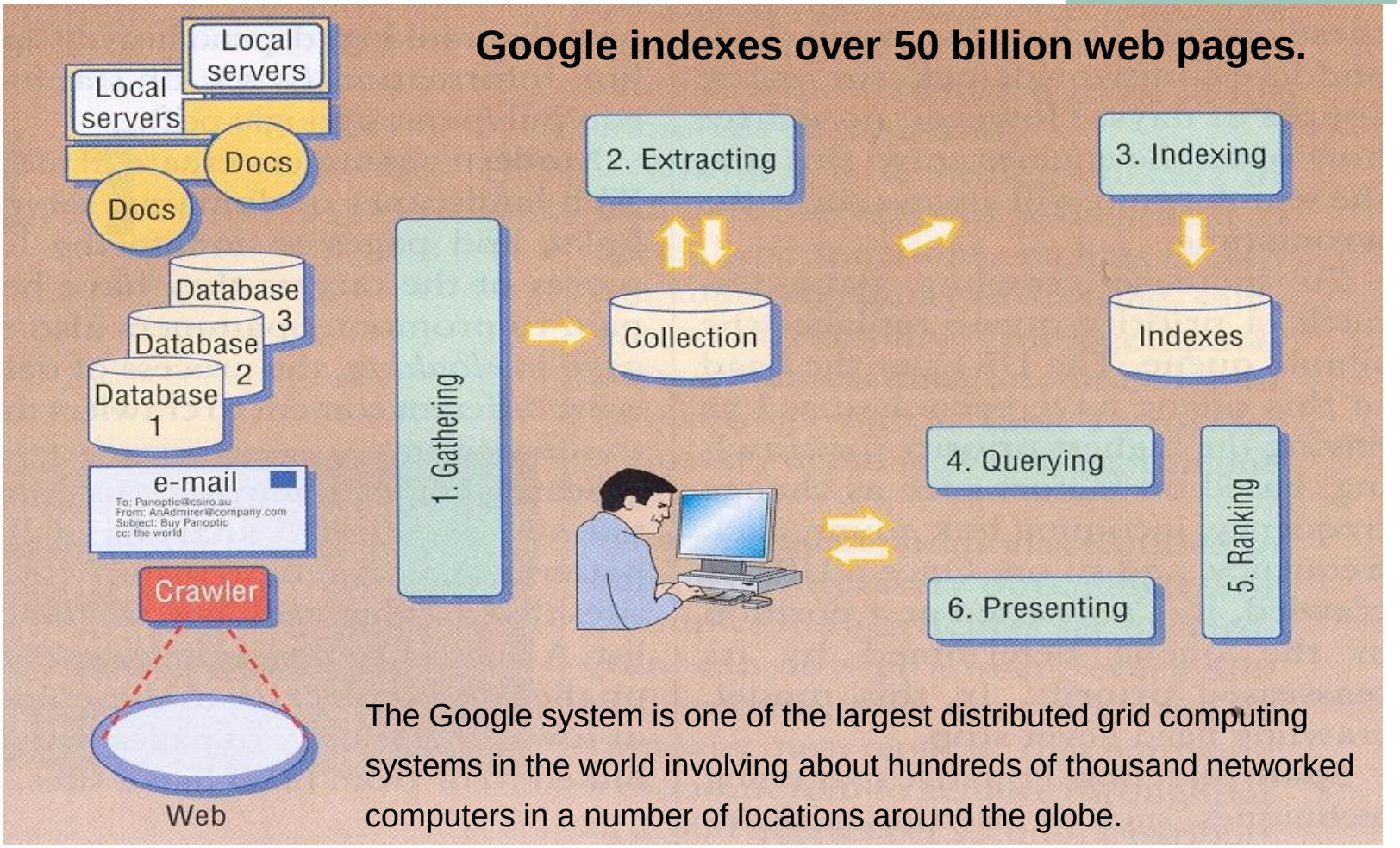
Virtual Private Networks

- **Tunneling** encrypts the data packet to be sent, and places it inside another packet; which provides confidentiality, authentication, and integrity of the message

Search Engines

- A search engine, like Google, sends out software robots or intelligent agents called "spiders"
- These spiders go from server to server to build indexes of the files, pages, keywords, and words within pages
- Each search engine has proprietary algorithms that prioritize pages for display (prioritization is sometimes based upon payments from the web page publishers to the directory service)
- Some engines search more pages at different levels within a web site that others
- Today search engine's algorithms try to find more relevant and precise hits by counting links to sites as a "vote" for a site's relevance
- The indices of each search engine are updated at different frequencies (daily, weekly, monthly, etc.)

Search Engine Operation

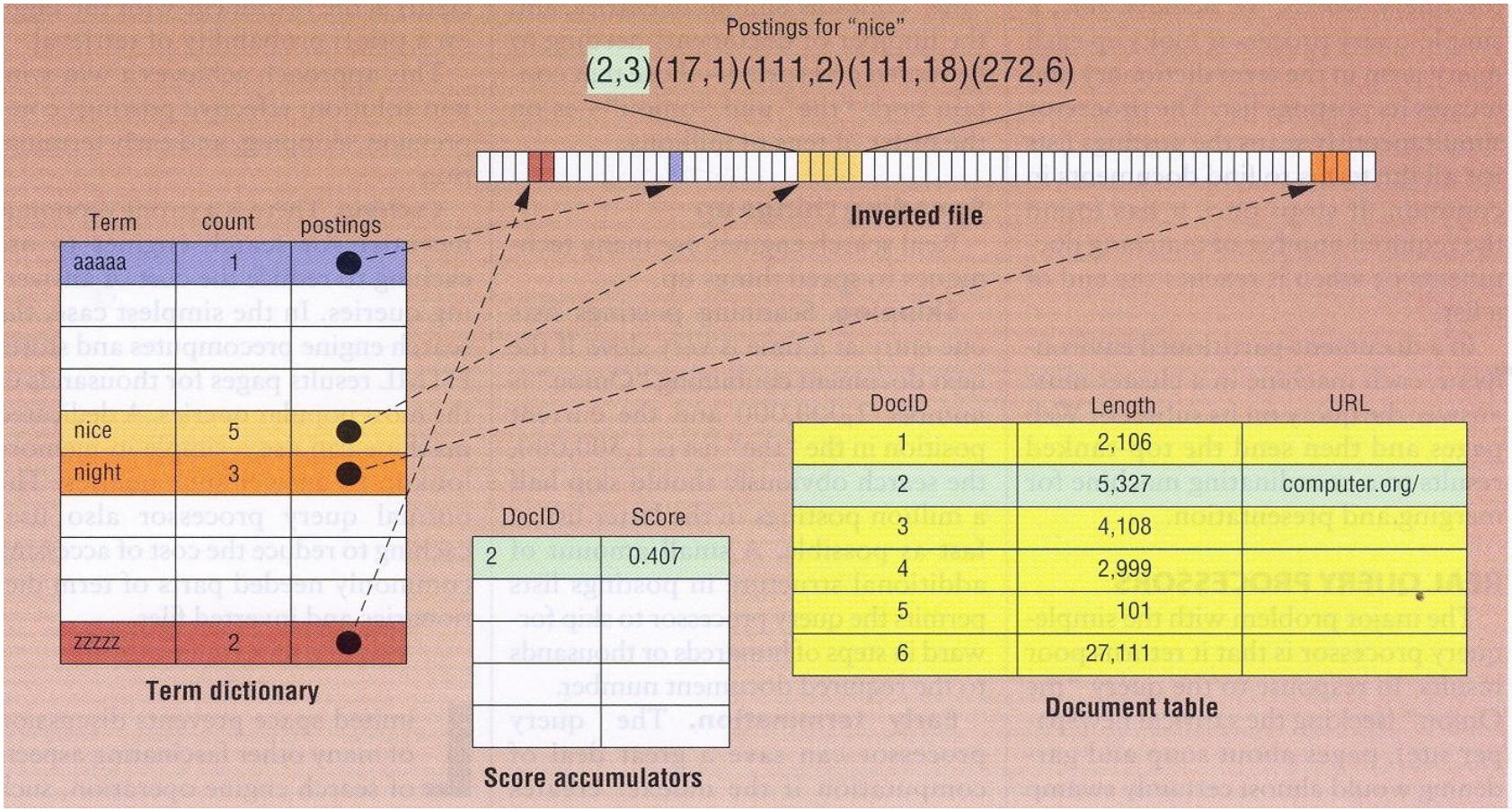


Google Indexing

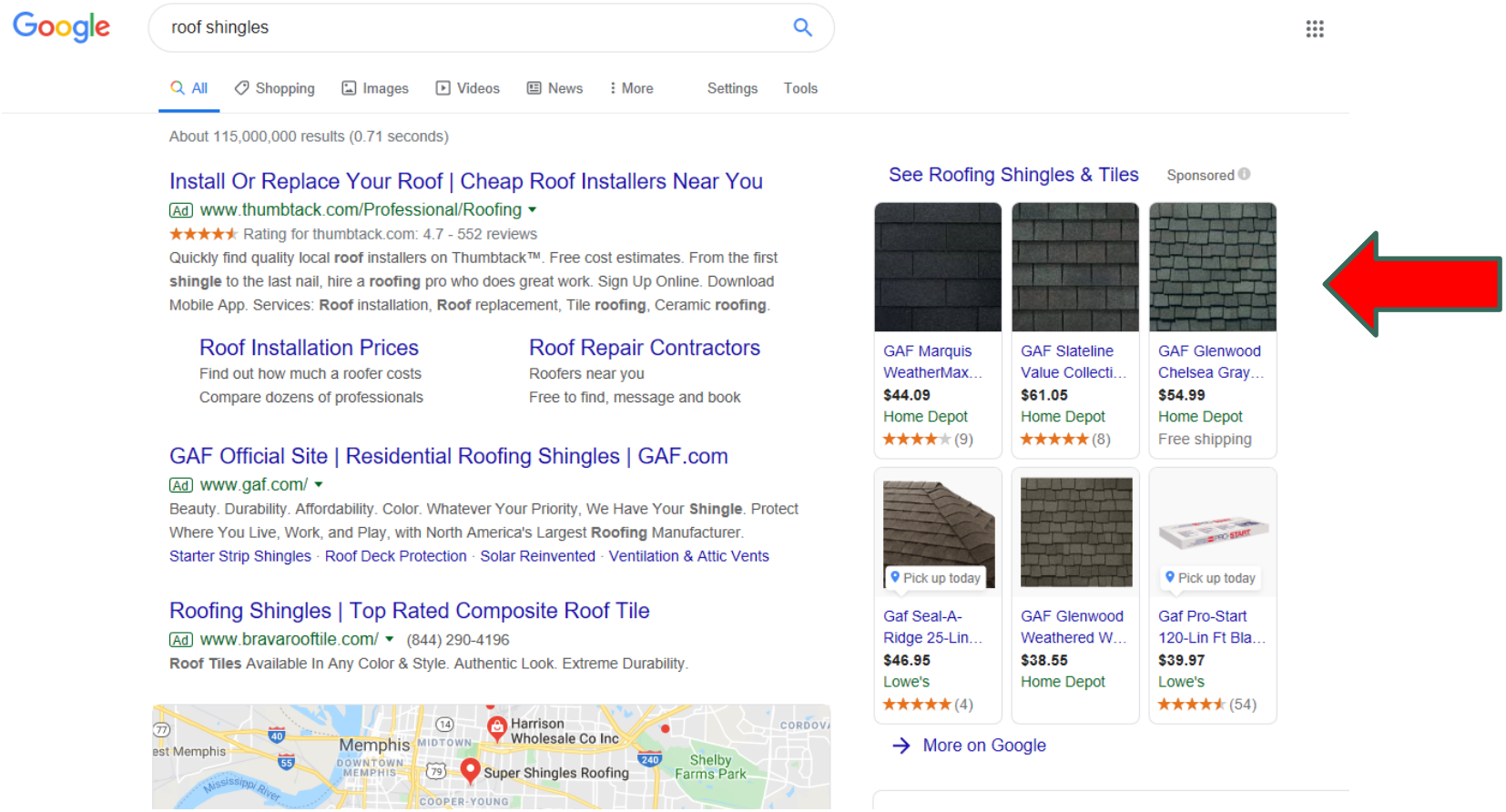
[see example on next slide]

- Google indexes thousands of terabytes and thousands of millions of queries each day
- An inverted index file is used which contains a concatenation of the postings for each distinct term
- Each entry in the inverted list is a sorted list of document ID's plus the position within the document
- The term dictionary is sorted alphabetically, and each entry points to the starting point in the inverted list
- There is also a scoring table to rank each document
- In the next slide example, the term "nice" is found in five documents, the first of which is document 2; nice is in document 111 two times
- The overall task of indexing terabytes of web pages is divided up amongst many computers, plus compressions and memory caching are used as well

Search Engine Operation



Google Search: Paid Ads vs Search

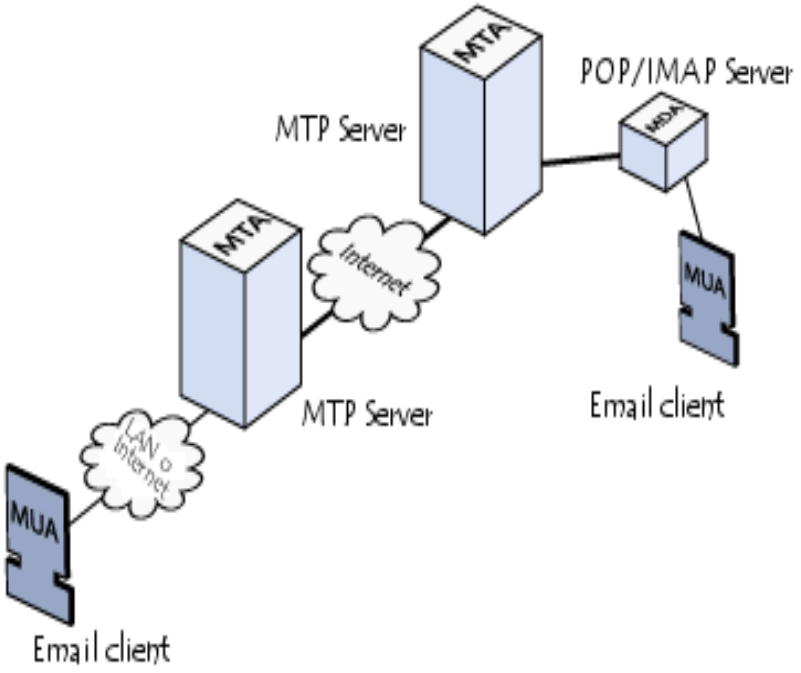


E-Mail

- A widely used service on the Internet
- Main types
  - Web-based e-mail
  - Client-based e-mail
- E-mail programs
  - Folders for organizing e-mails
  - Address book and distribution groups
  - Spell checkers and delivery notifications

Email (con't)

- Agents
  - MUA – Mail User Agent (email client)
  - MTA – Message Transfer Agent ("post office")
  - MDA – Message Delivery Agent ("mailbox")
- Protocols
  - SMTP – Simple Mail Transport Protocol
  - POP – Post Office Protocol (older)
  - IMAP – Internet Message Access protocol



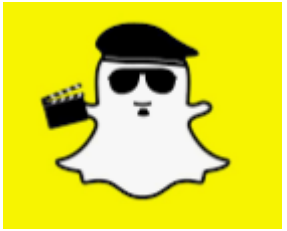
Text Message (SMS)

- **Short Message Service** (**SMS**) is a text messaging service component of phone, Web, or mobile communication systems
- It uses standardized communications protocols to allow fixed line or mobile phone devices to exchange short text messages
- SMS as used on modern handsets originated from radio telegraphy in radio memo pagers using standardized phone protocols
- These were defined in 1985 as part of the Global System for Mobile Communications (GSM) series of standards as a means of sending messages of up to 160 characters to and from GSM mobile handsets

Instant (text) Message

- Now commonly called “instant messaging” (IM)
- 95% of text messages are opened and read
  - On average emails are read within 48 hours
  - On average text messages are read within 4 minutes
- 50% of all local searches are from mobile devices now
- Mobile phones are now the most common device used for web browsing, surpassing tradition pc/laptop/tablets in 2013

Snapchat



- Snapchat
  - New type of messaging offered by a mobile app
  - Users combine pictures, videos, text, and drawings into “Snaps” that are sent to other users
  - Snaps self-destruct in a matter of seconds, but may be undeleted and brought back to life

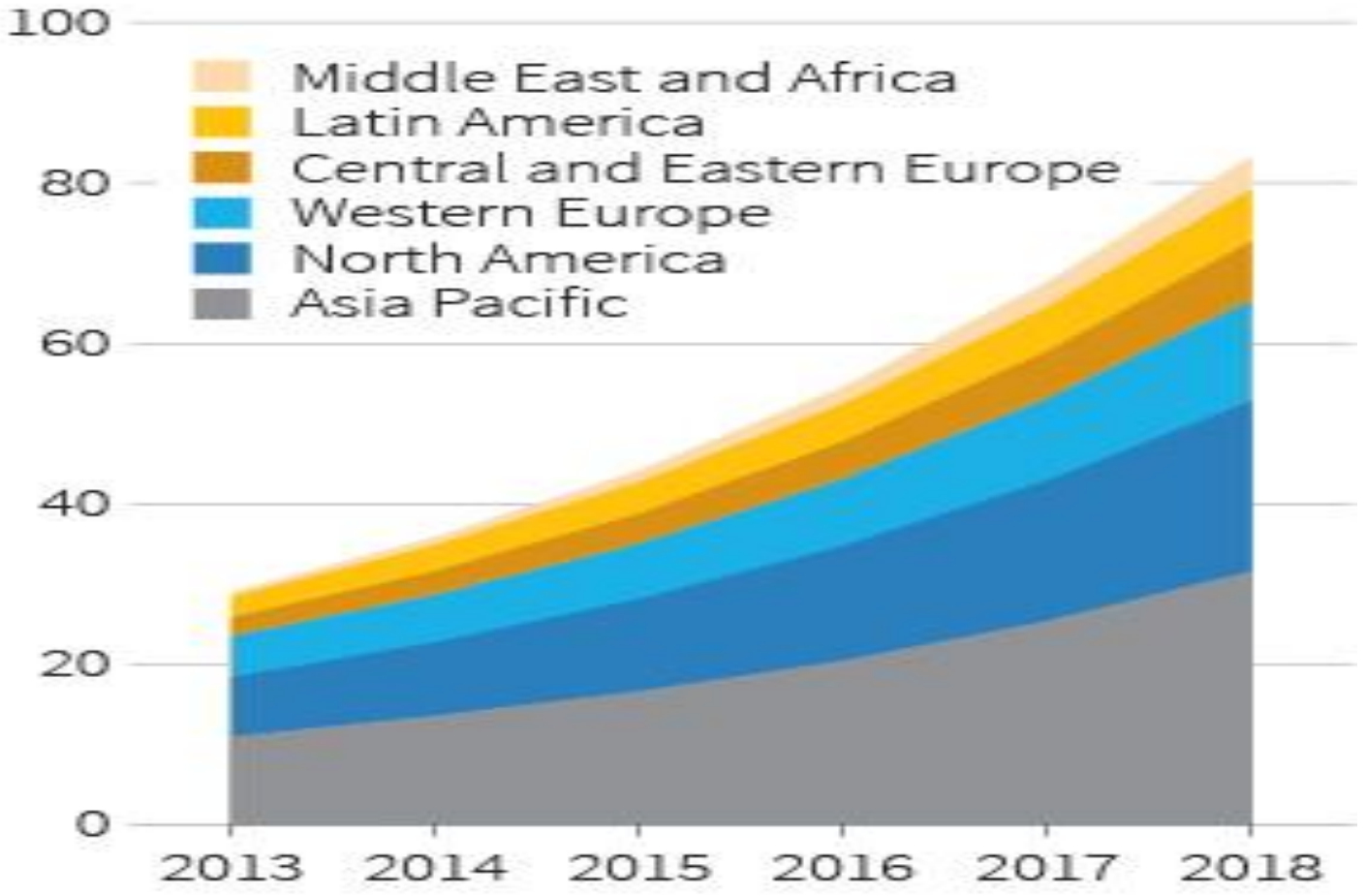
Group Colaboration

- **Discussion groups**
  - Formed for people to exchange opinions and ideas on a specific topic
  - Group members post messages or articles that others in the group can read
- **Newsgroups**
  - General in nature and can cover any topic
  - Allow people to get together for fun or for business purposes
- **Weblog** (BLOG) is a personal Web site, open to the public, where the creator expresses feelings or opinions
- **Wiki** is a Web site on which anyone can post material and make changes quickly, without using difficult commands – www.wikipedia.com

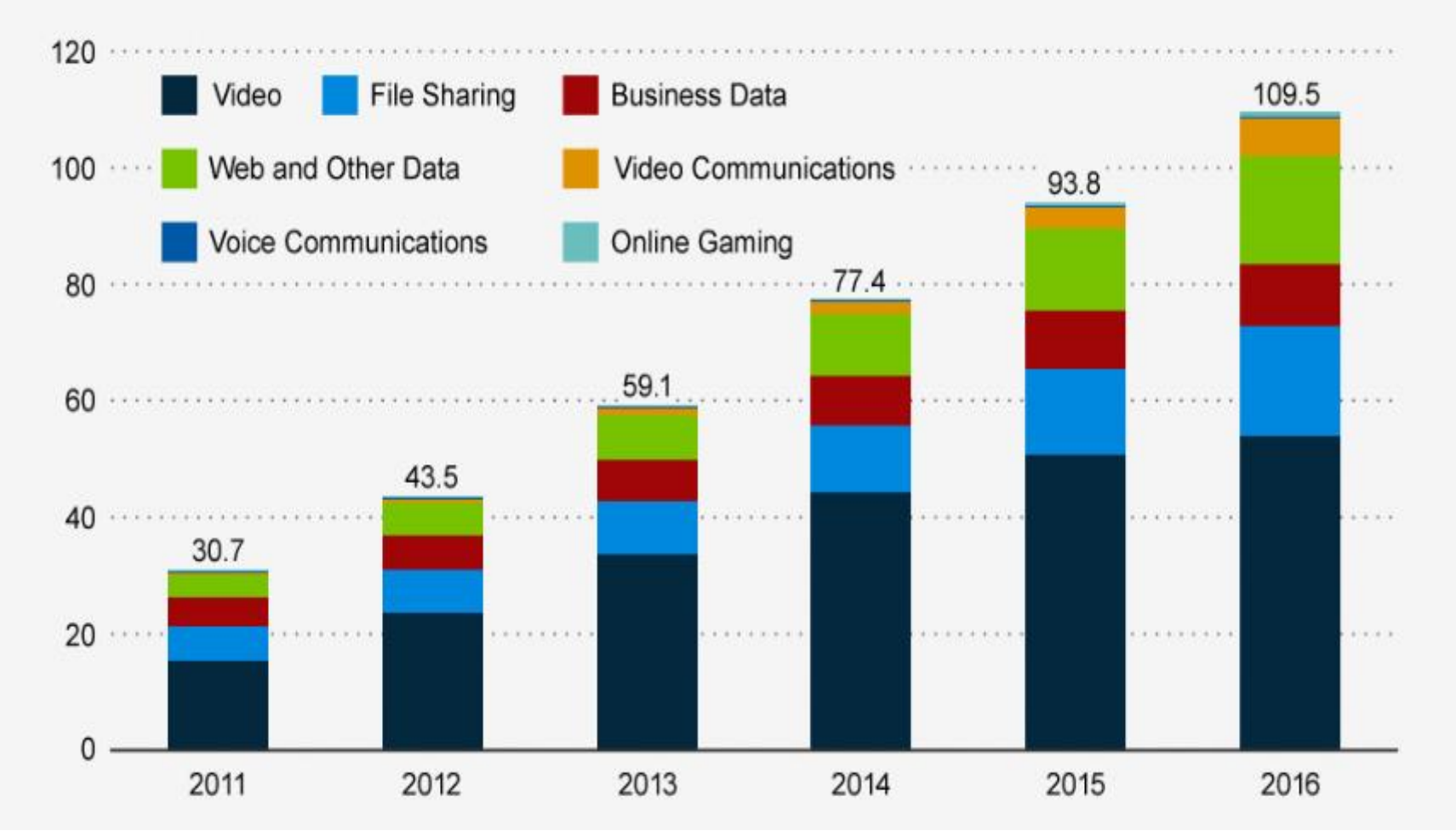
Podcasting

- Electronic audio/video file posted on the Web for users to download to their mobile devices or computers
  - Consists of a specific URL and is defined with an XML item tag
  - Collected by an aggregator
    - iTunes or iPodder
  - Users can subscribe to a podcast
    - Increases accessibility

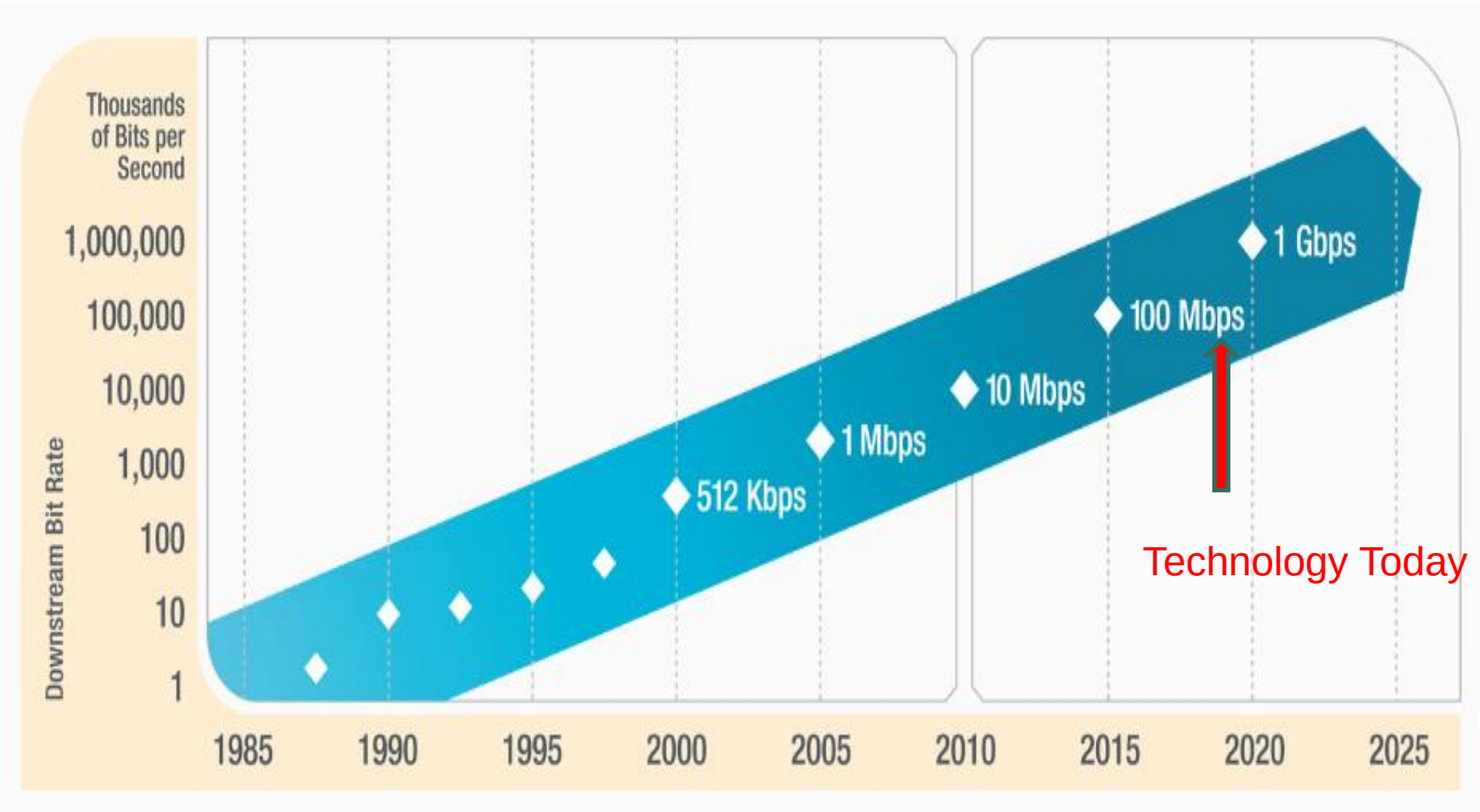
Worldwide Internet Users (millions)



Internet Data Usage Over Time (Exabytes/month)



Internet Speed Over Time

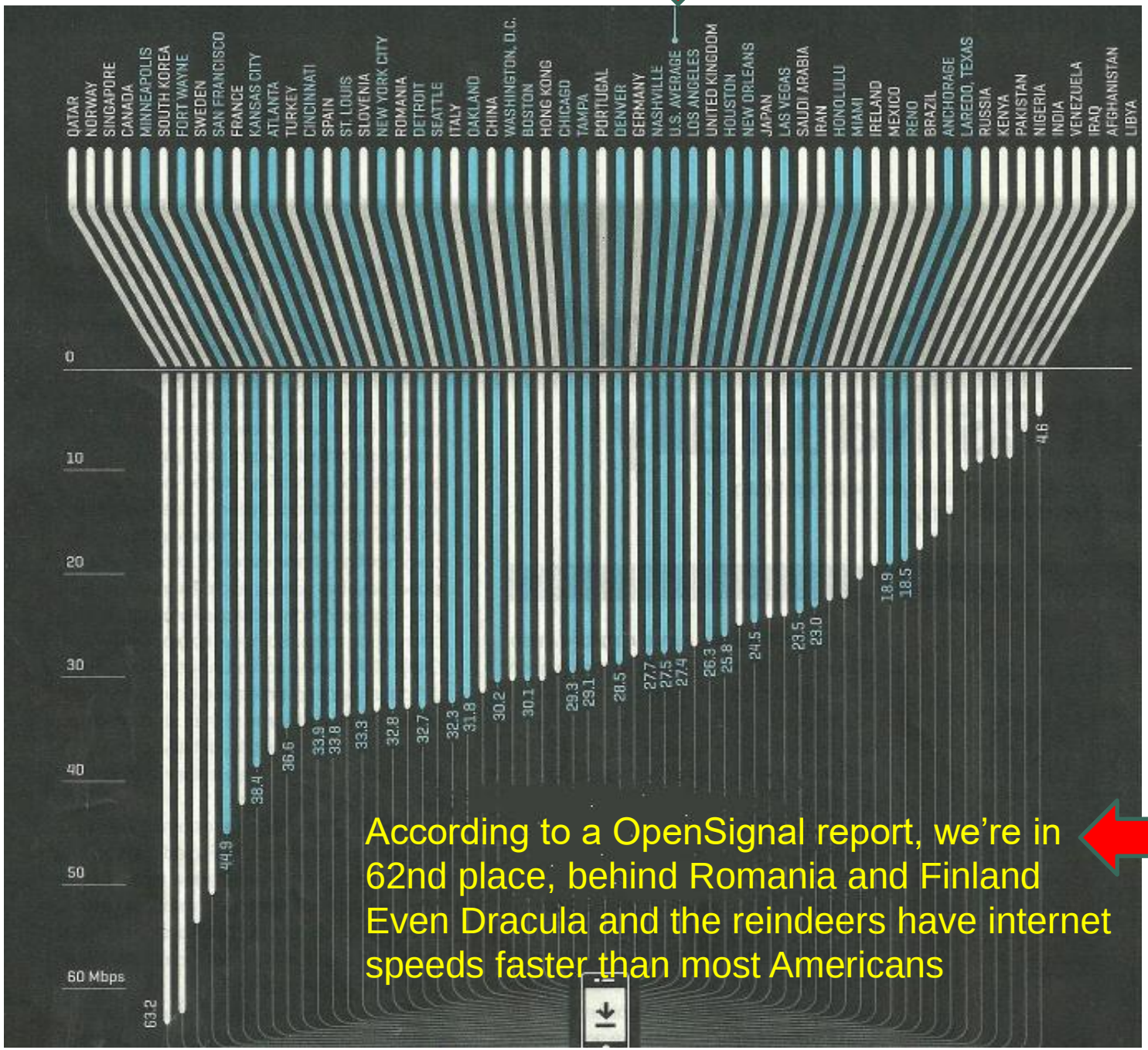


2019 Internet Speeds Mbps

US Ave 27.5

Ave Memphis 20 Mbps

My home 33 Mbps

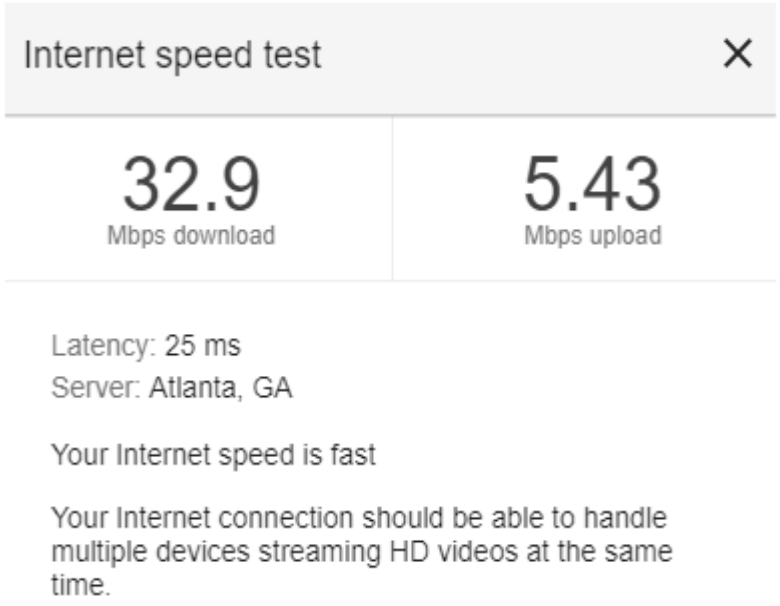


How Much Speed is Needed

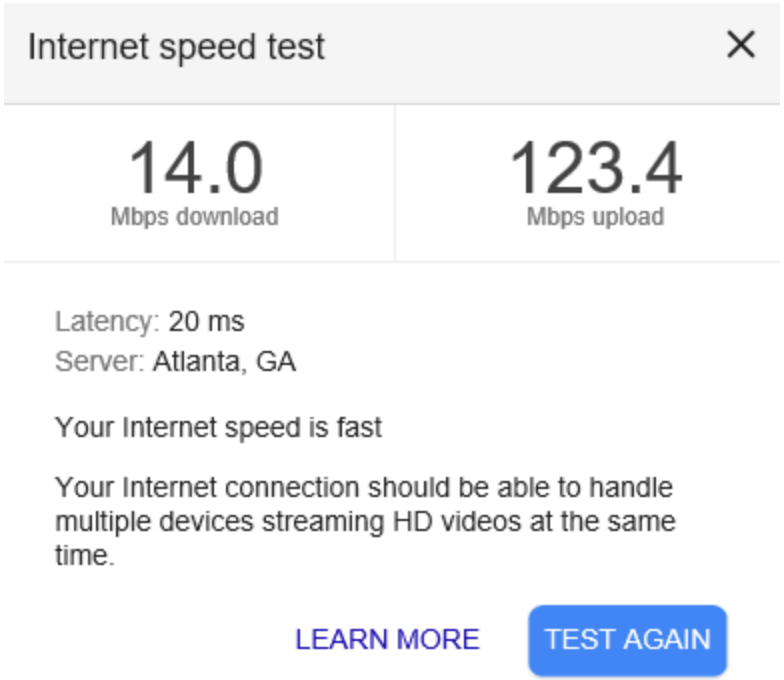
- Email and basic computing: 3-4 Mbps is recommended
- Skype group video calls: 10+ Mbps is recommended
- Large file transfers: 40+ Mbps is recommended
- The Federal Communications Commission (FCC) recommends internet speeds of 12-25 Mbps for families with multiple internet users or for frequent online streaming
- The minimum internet speed recommended for streaming Netflix is 3 Mbps, but recommended speeds vary by the quality you want to view:
  - To stream videos in standard definition, at least 3 Mbps is recommended
  - To stream videos in HD, at least 5 Mbps is recommended
  - To stream videos in HDR or 4K, at least 25 Mbps is recommended

Local Internet Speed

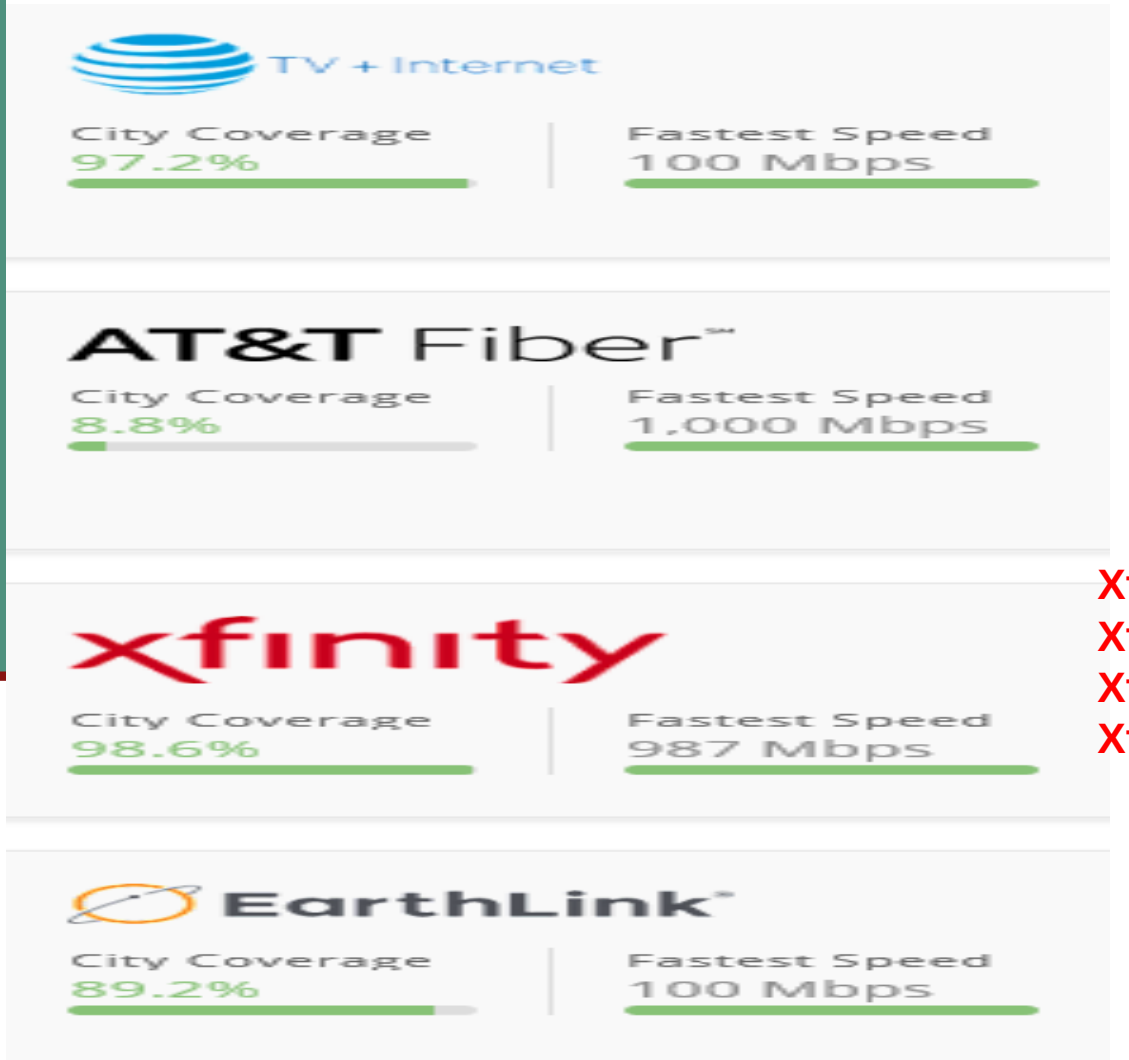
My House (Comcast)



My CBU Office



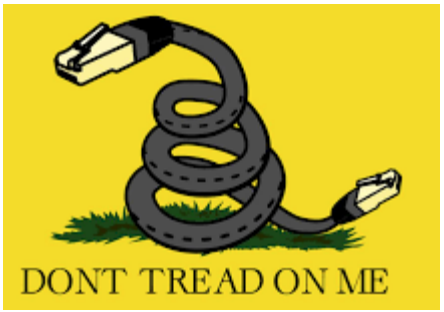
Local Internet Speed (con't)



Xfinity "Performance"- 100Mbps
Xfinity "Blast" – 200 Mbps
Xfinity "Pro" – 300 Mbps
Xfinity "Extreme Pro" – 600 Mbps

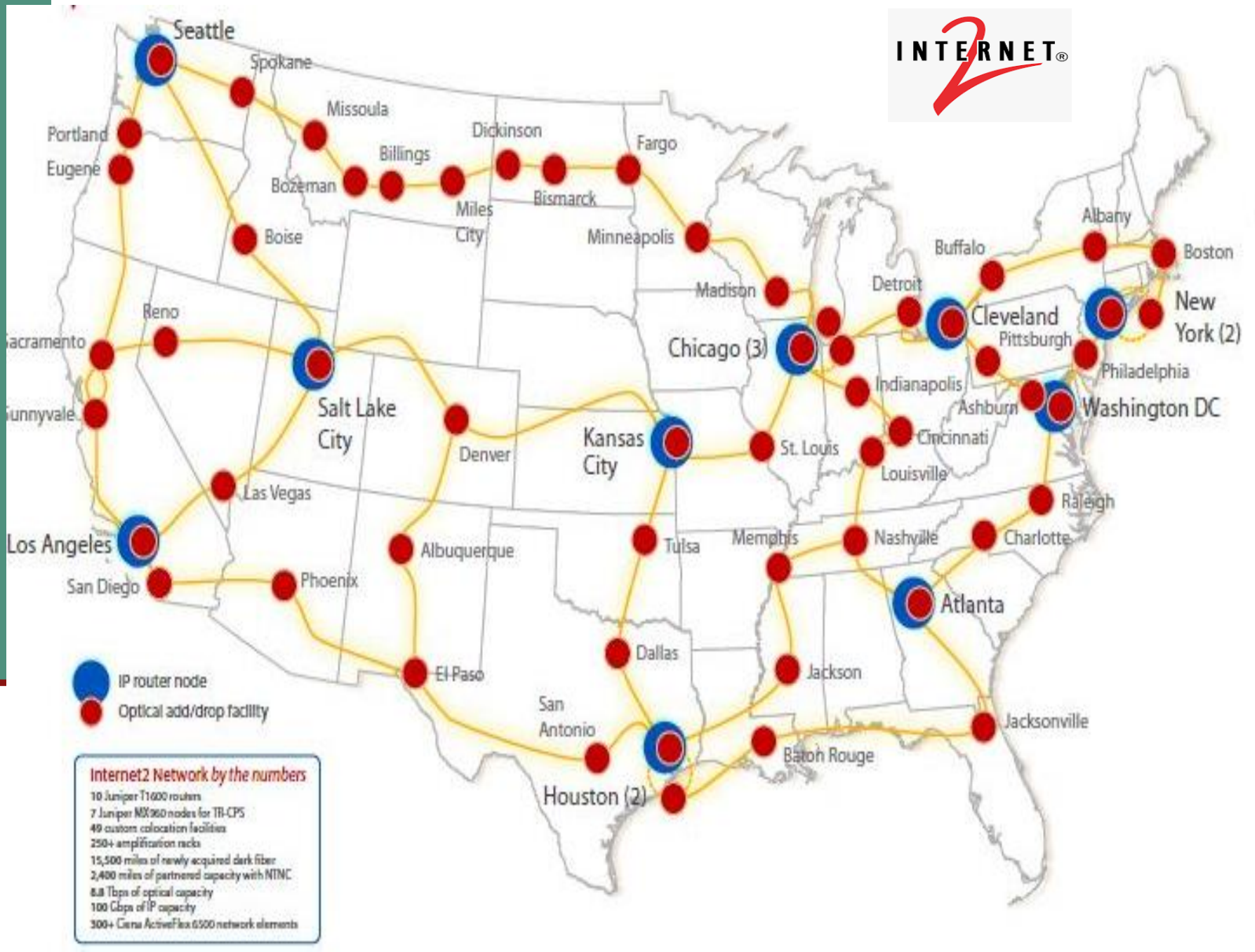
Net Neutrality

- *Net neutrality* is the principle that governments should mandate Internet service providers to treat all data on the Internet the same, and not discriminate, set speed, or charge differently by user, content, website, platform, application, type of attached equipment, or method of communication



The Internet2

- Collaborative effort involving more than 200 U.S. universities and corporations
  - Goal: develop ultra fast fiber based connections and advanced Internet technologies for higher education and academic research
- Gigapop: local connection point-of-presence that connects a variety of high-performance networks
  - Main function: exchange I2 traffic with a very high bandwidth

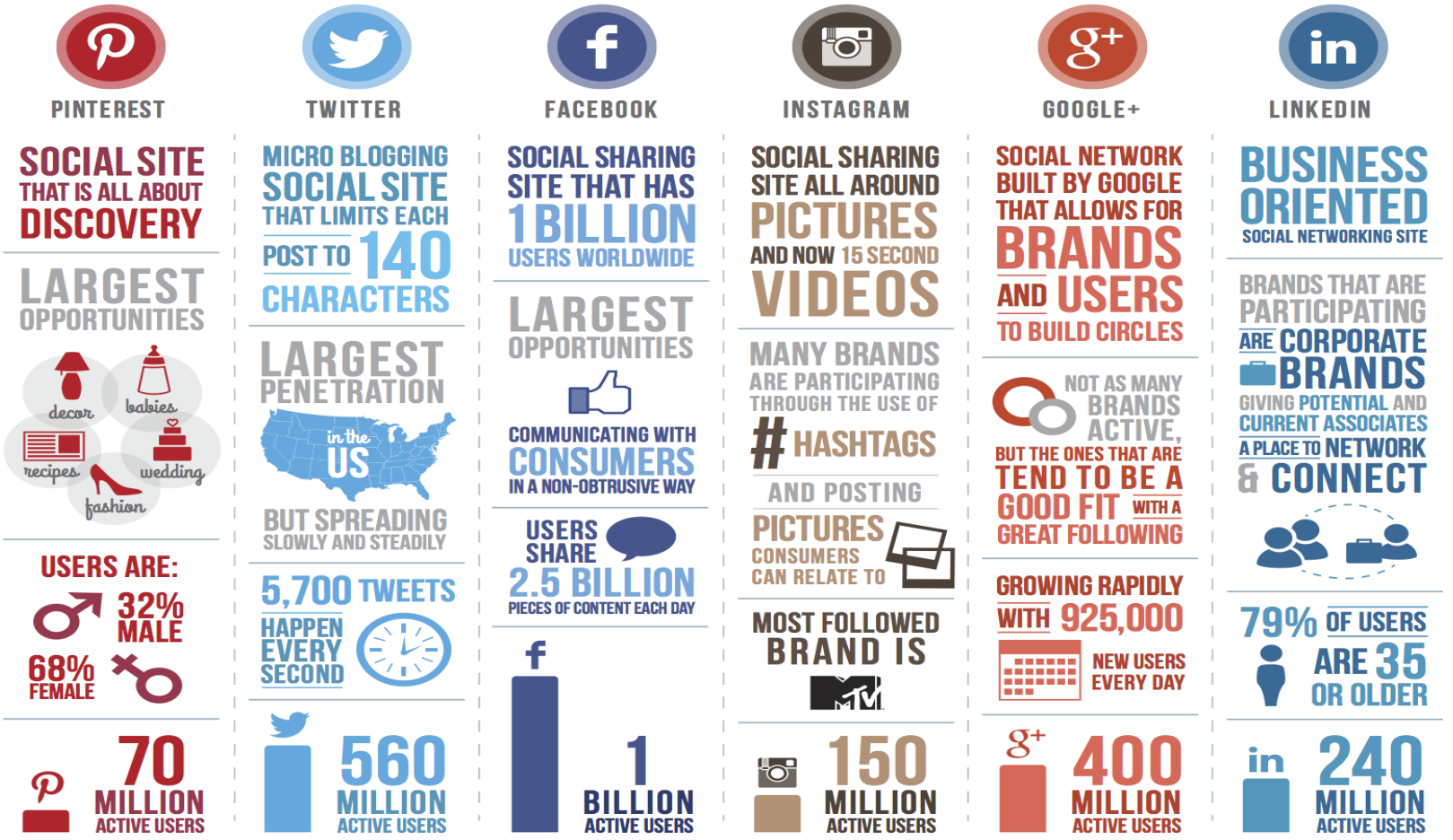

INTERNET2®
Seattle
Spokane
Portland
Eugene
Missoula
Billings
Dickinson
Fargo
Bozeman
Miles City
Bismarck
Boise
Minneapolis
Albany
Buffalo
Boston
Madison
Detroit
Cleveland
New York (2)
Reno
Chicago (3)
Pittsburgh
Philadelphia
Indianapolis
Ashburn
Washington DC
Salt Lake City
Denver
Kansas City
St. Louis
Cincinnati
Louisville
Las Vegas
Raleigh
Los Angeles
Albuquerque
Tulsa
Memphis
Nashville
Charlotte
San Diego
Phoenix
Atlanta
Dallas
El Paso
Jackson
San Antonio
Jacksonville
Baton Rouge
Houston (2)
IP router node
Optical add/drop facility
Internet2 Network by the numbers
10 Juniper T1600 routers
7 Juniper MX960 nodes for TR-CPS
49 custom colocation facilities
250+ amplification racks
15,500 miles of newly acquired dark fiber
2,400 miles of partnered capacity with NTNC
8.8 Tbps of optical capacity
100 Gbps of IP capacity
300+ Ciena CoreFlow 6500 network elements

Web 2.0

Web 2.0 is about networking people as opposed to networking computers and technology !

Source: http://web2.wsj2.com

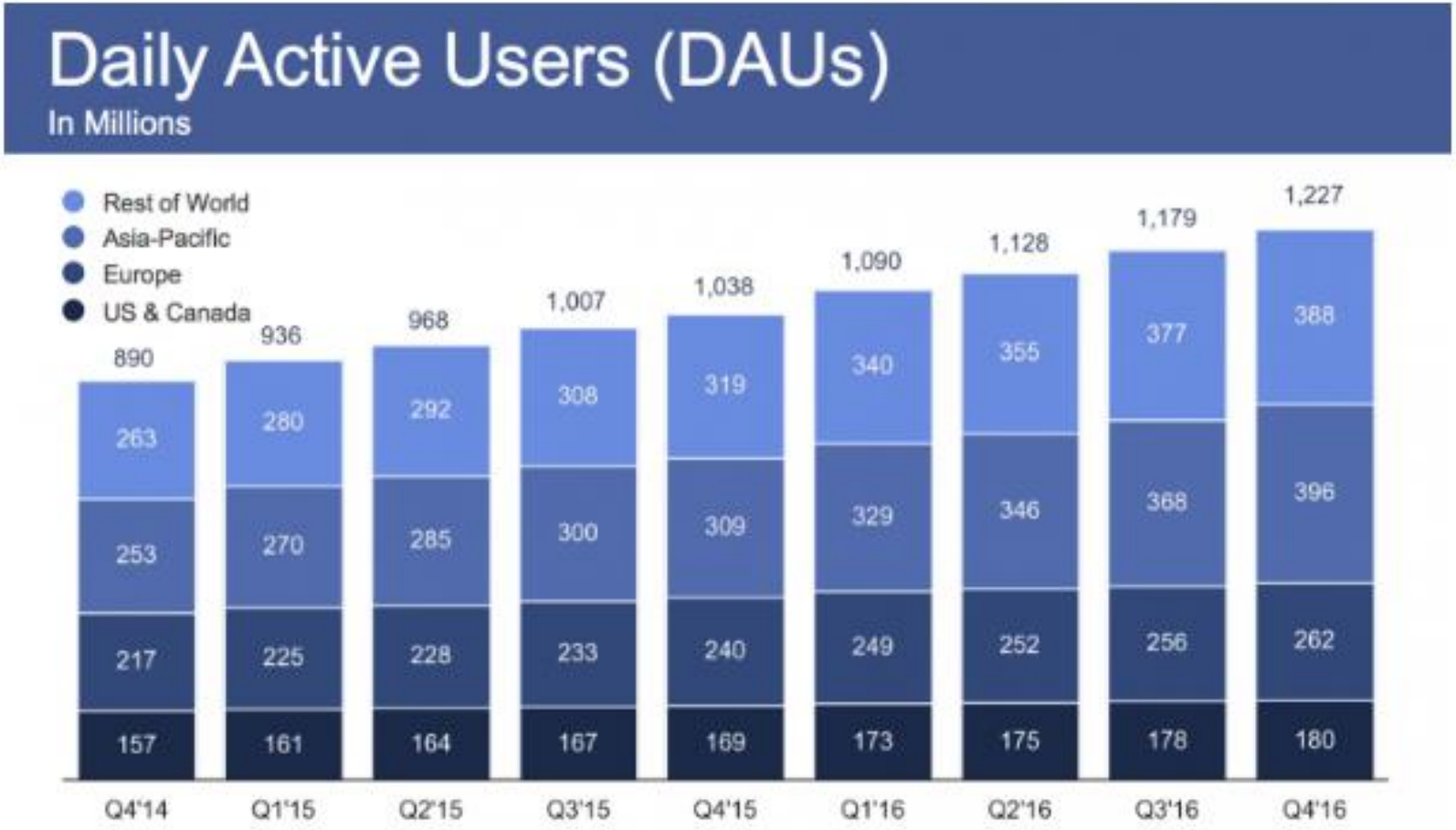
Major Social Networking Sites



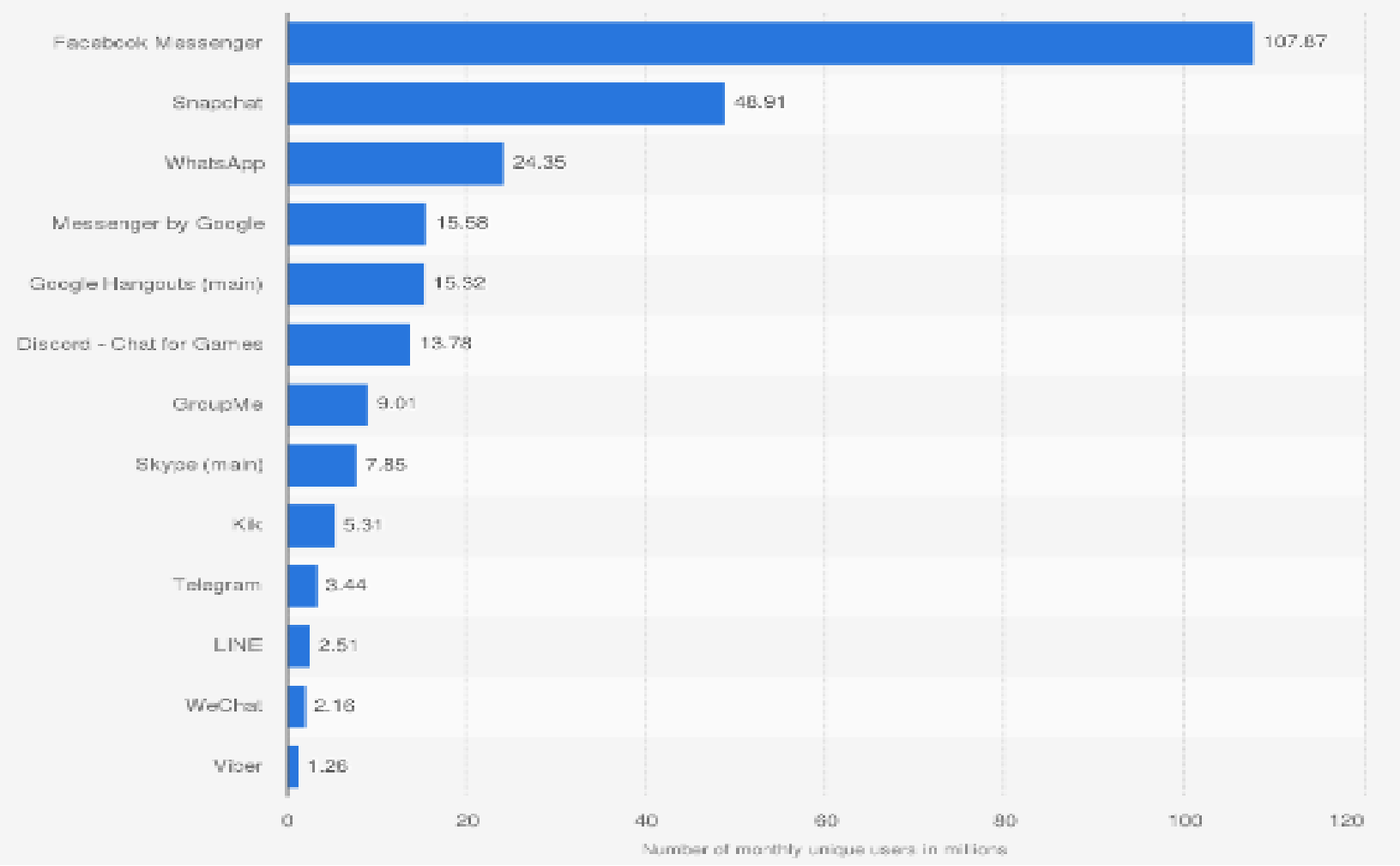
Facebook

- **People on Facebook**
  - More than 1.5 billion active users
  - More than 50% of active users log on to Facebook in any given day
  - Average user has hundreds of friends
- **Activity on Facebook**
  - About 70% of adult online users visit Facebook at least once a month
  - On average, hundreds of millions photos are uploaded per day
- **Global Reach**
  - More than 70 languages available on the site
  - More than 75% of users are outside of the United States
  - Over 300,000 users helped translate the site through the translations application
- **Mobile**
  - More than 500 million active users currently access Facebook through their mobile devices
  - More than 500 mobile operators globally work to deploy and promote Facebook mobile products

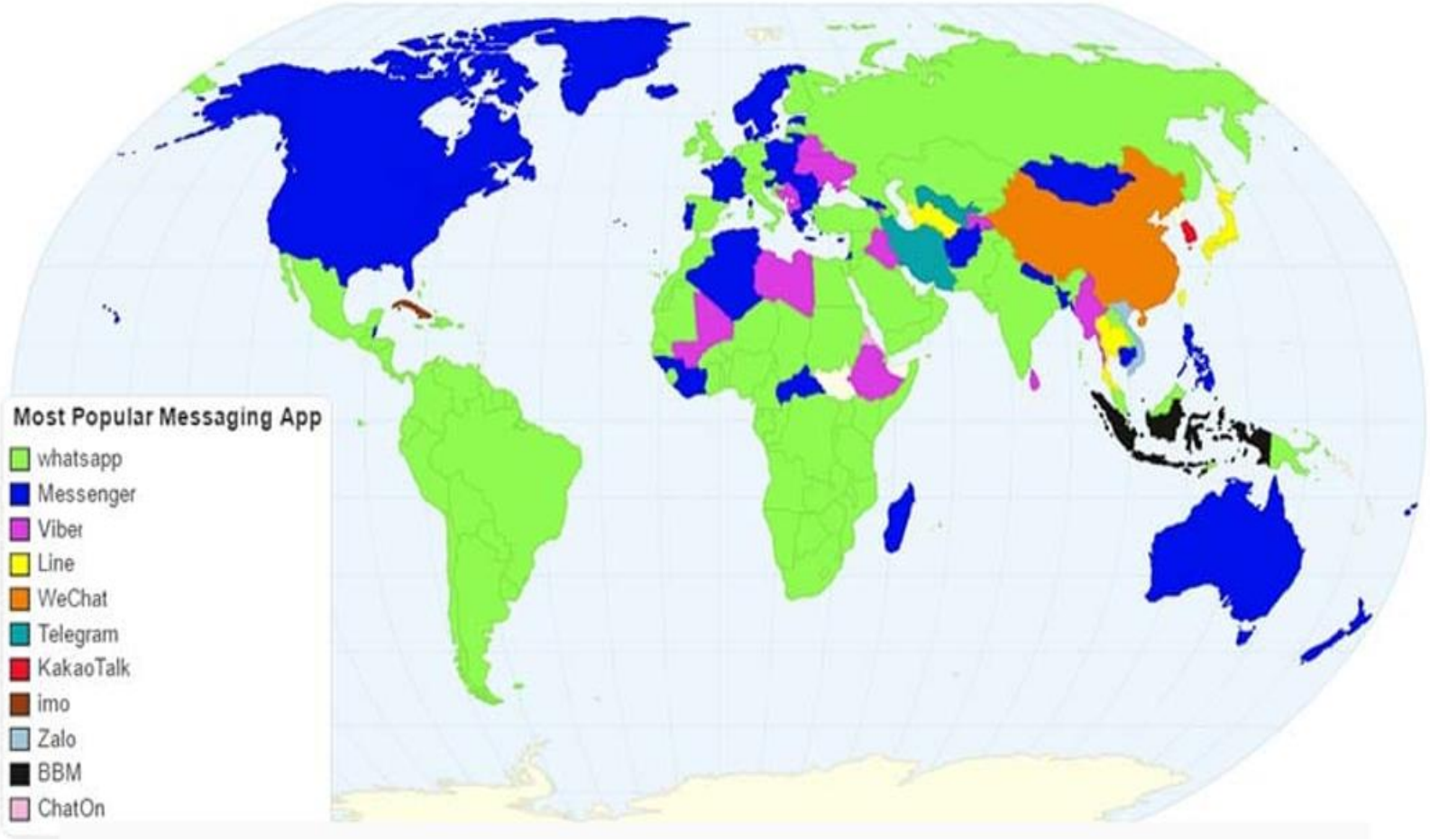
Facebook Users



US Facebook Messenger Popularity



Global Messenger Popularity



Demise of Yahoo

- "In 1998, Yahoo could have bought upstart Google for $1 million
  - But Yahoo refuse to do so
- In 2002, Yahoo was again in talks to buy Google, but Google wanted more money
  - Yahoo refused the offer
- In 2006, Yahoo wanted to buy Facebook for $1 billion
  - Facebook backed out
- In 2008, Microsoft offered to buy Yahoo for $44.6 billion
  - But Yahoo refused
- In 2016, Verizon bought Yahoo for only $4.8 billion"

Twitter

- **Twitter** is an online social networking service that enables users to send and read short 140-character messages called "tweets"
- Registered users can read and post tweets, but those who are unregistered can only read them
- Users access Twitter through the website interface, SMS or mobile device app
- Twitter Inc. is based in San Francisco and has more than 25 offices around the world
- Twitter was created in March 2006 by Jack Dorsey, Evan Williams, Biz Stone, and Noah Glass and launched in July 2006
- Twitter is one of the ten most-visited websites and has been described as "the SMS of the Internet“
- Twitter has more than 500 million users who send over 500 million tweets per day

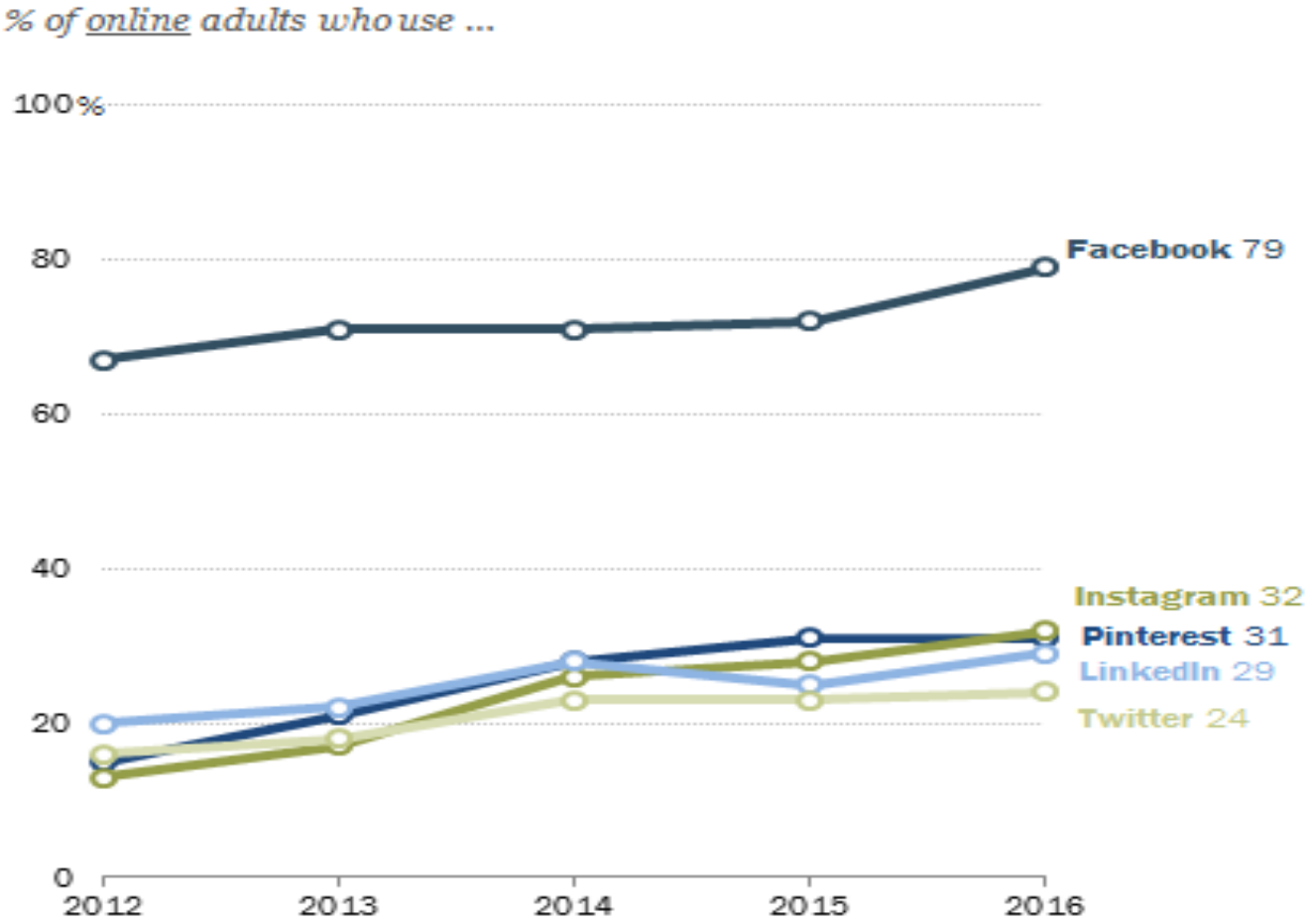
LinkedIn

- Business focused
- About 500 million professional members
- Several new members every second
- 200 plus countries
- 1st, 2nd, 3rd connections
- Give & get recommendations
- Groups & settings
- Job change notifier

Pinterest

- **Pinterest, Inc.** is a social media web and mobile application company
- It operates a software system designed to enable saving and discovery of information on the World Wide Web using images and, on a smaller scale, GIFs and videos
- Pinterest has reached 300 million monthly active users as of August 2019
- Pinterest CEO Ben Silbermann summarized the company as a "catalogue of ideas" that inspires users to "go out and do that thing"

Adult Users

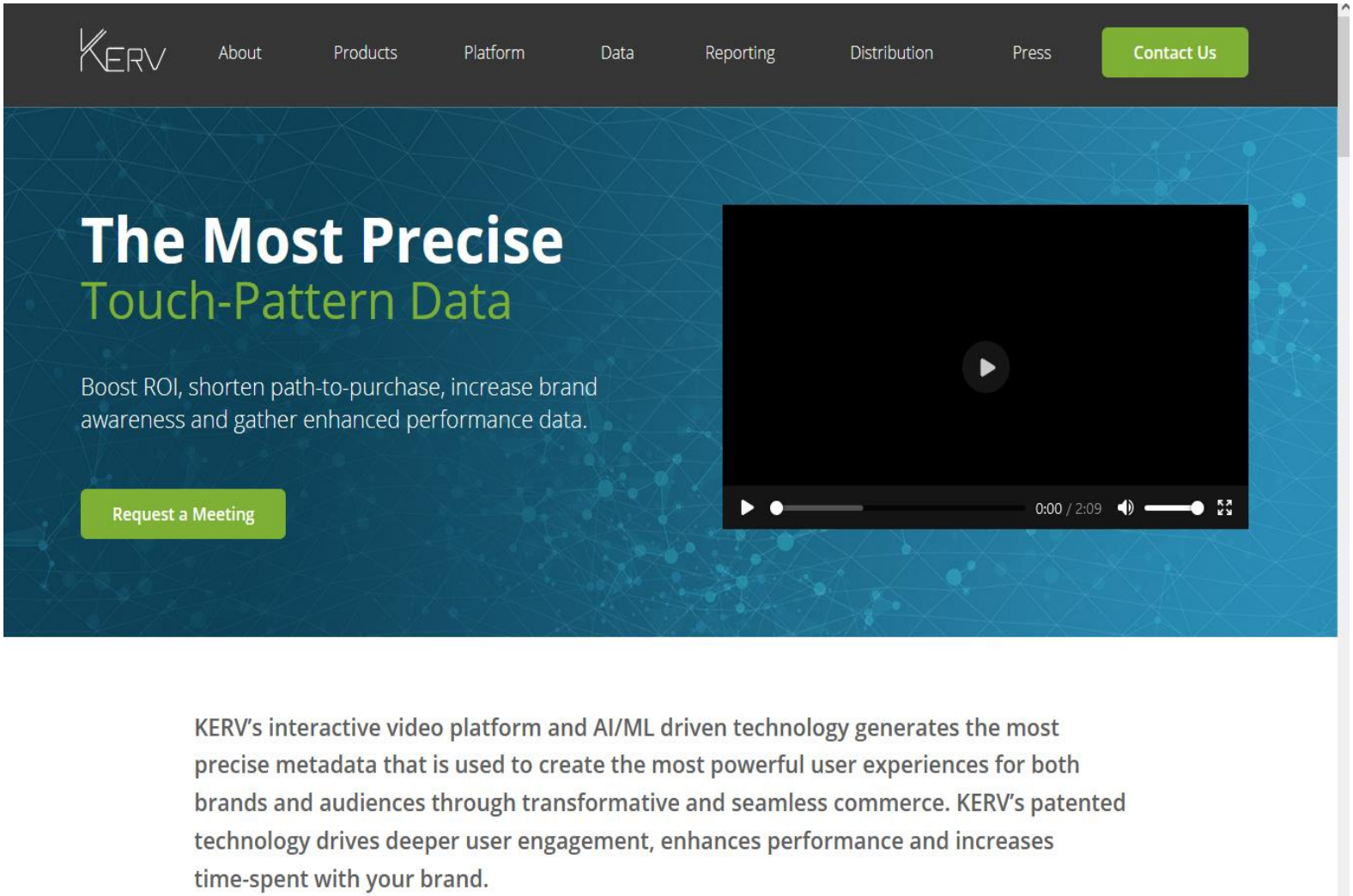


Instagram

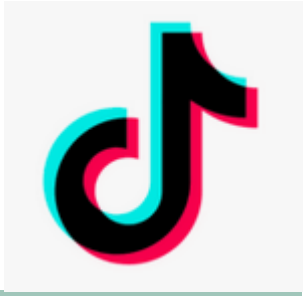
- **Instagram** (commonly abbreviated to **IG** or **Insta**) is an American photo and video sharing social networking service owned by Facebook
- The app allows users to upload media that can be edited with filters and organized by hashtags and geographical tagging
- Posts can be shared publicly or with pre-approved followers, and users can browse other users' content by tags and locations and view trending content

Ember Shoppable Tags in Videos

[links to products on e-commerce sites]



TikTok



- Americans spend more time on TikTok than Facebook in 2020
- Mobile users spend 21.5 hours per month on TikTok versus 17.5 for Facebook
- Tiktok is built for social entertainment with addictive short videos
- Business is just starting to use Tiktok for marketing
- Many copycat products are emerging such as Instagram Reels

Income from Social Media Content

- YouTube creators earn money a number of ways, but money from the ads that play in their videos usually constitutes a big chunk of their income
- Andrei Jikh,a finance YouTuber with 1.7 million subscribers, has earned $1.6 million in ad revenue in less than three years, for example
- Lifestyle creator Tiffany Ma earns up to $11,500 a month from ads on her videos
  - "To really optimize your audience, I think YouTubers should definitely put three to four ads within a video," Ma said

Income from Social Media (con't)

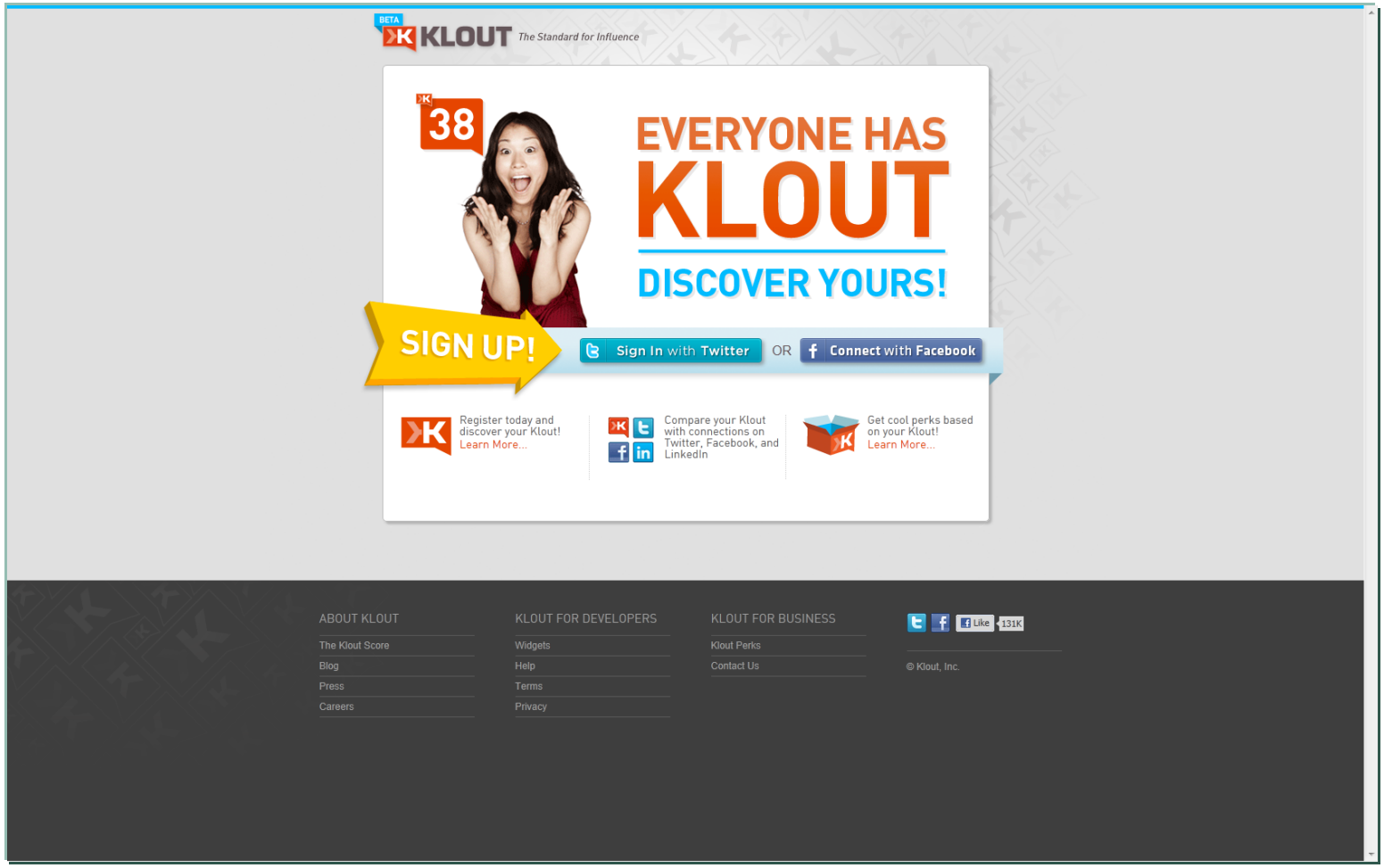
- To start earning money directly from YouTube, creators must have at least 1,000 subscribers and 4,000 watch hours in the past year
- Once they reach that threshold, they can apply for YouTube's Partner Program, which allows them to start monetizing their channels through ads, subscriptions, and channel memberships
- For every 1,000 ad views, advertisers pay a certain rate to YouTube; YouTube takes 45% of the revenue, and the creator gets the rest
- Two key metrics for earning money on YouTube are the CPM rate, or how much money advertisers pay YouTube per 1,000 ad views, and RPM rate, which is how much revenue a creator earns per every 1,000 video views after YouTube's cut

Reputation Management

- What are people saying about your company, about you
- What if its bad
- What if nothing is there at all
- Reputation Software
  - Social Mention
  - Klout
  - Google Alerts
  - Addict-o-Matic
  - Blog Pulse
  - Monitor.com

Social Mention

Klout



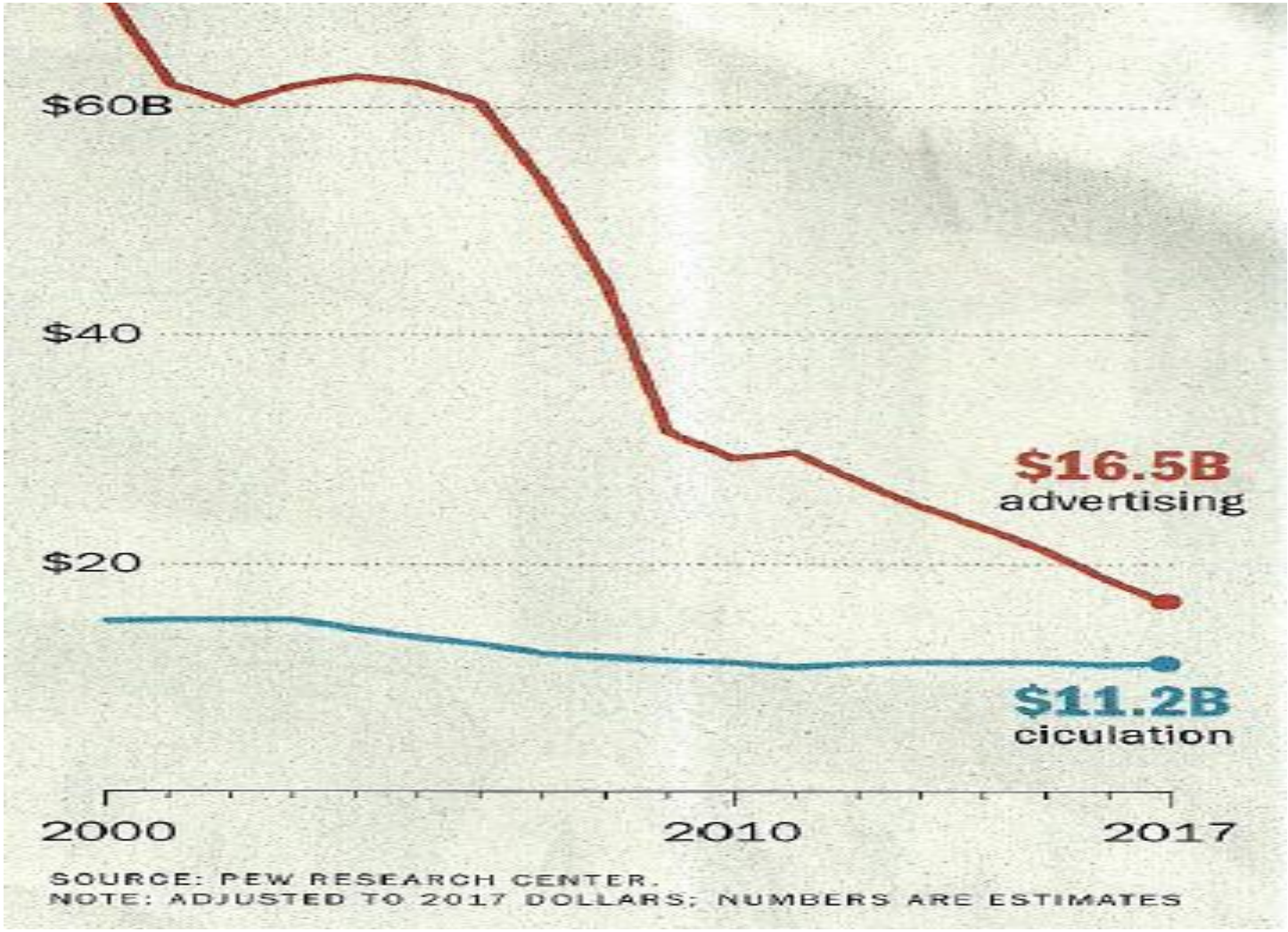
Business Application of Social Networks

- Social networks used for promotion – digital marketing
  - Facebook
  - Instagram
  - Twitter
  - Pinterest
  - LinkedIn Groups
  - YouTube
  - Yelp, Foursquare, and Level Up

Modern Marketing

- Social media is:
  - Better
  - Cheaper
  - Faster
- Than traditional marketing channels:
  - Print
  - TV
  - Radio
  - Billboard

Newspapers

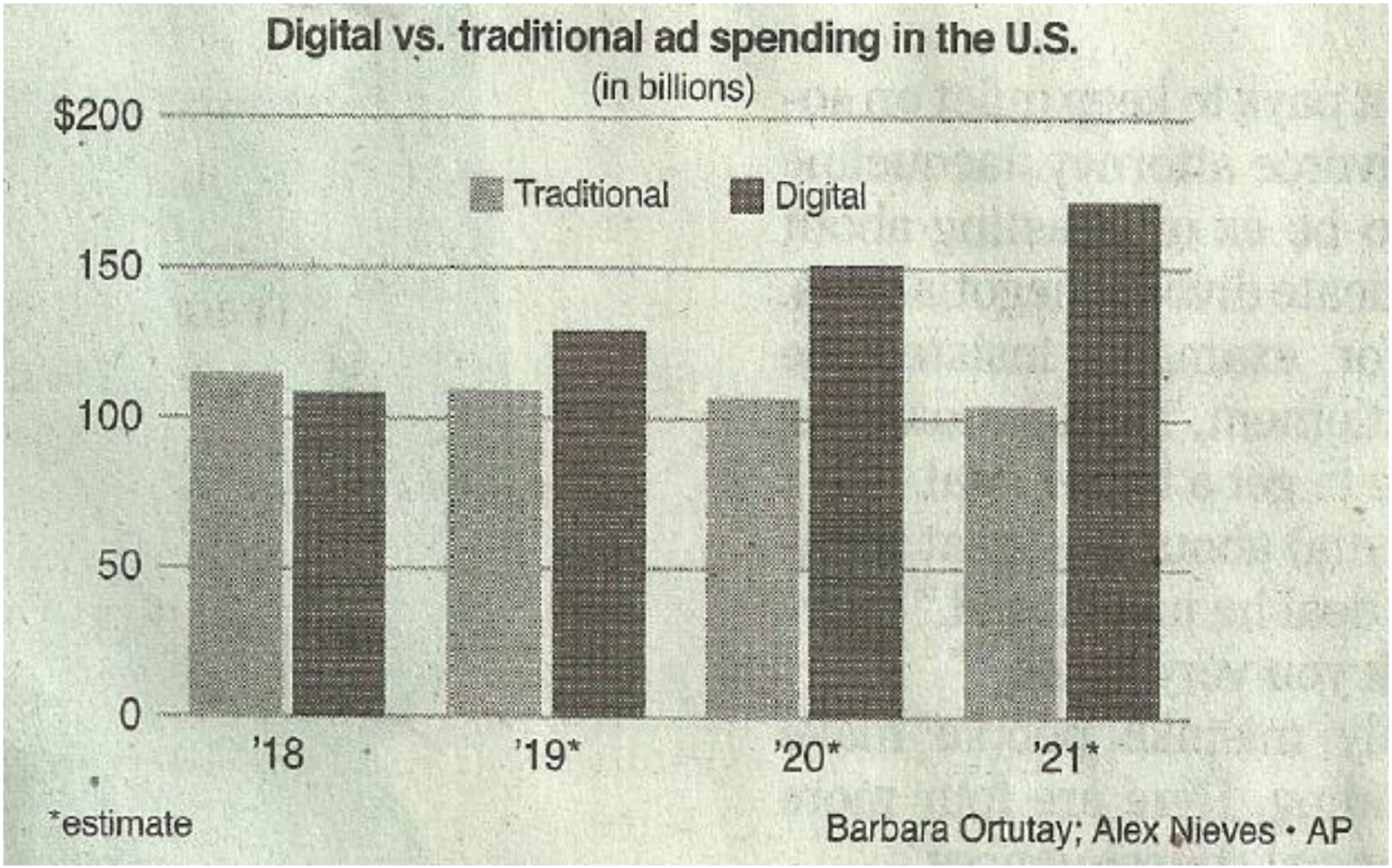

$60B
$40
$20
$16.5B
advertising
$11.2B
ciculation
2000
2010
2017
SOURCE: PEW RESEARCH CENTER.
NOTE: ADJUSTED TO 2017 DOLLARS; NUMBERS ARE ESTIMATES

Traditional vs Digital Marketing

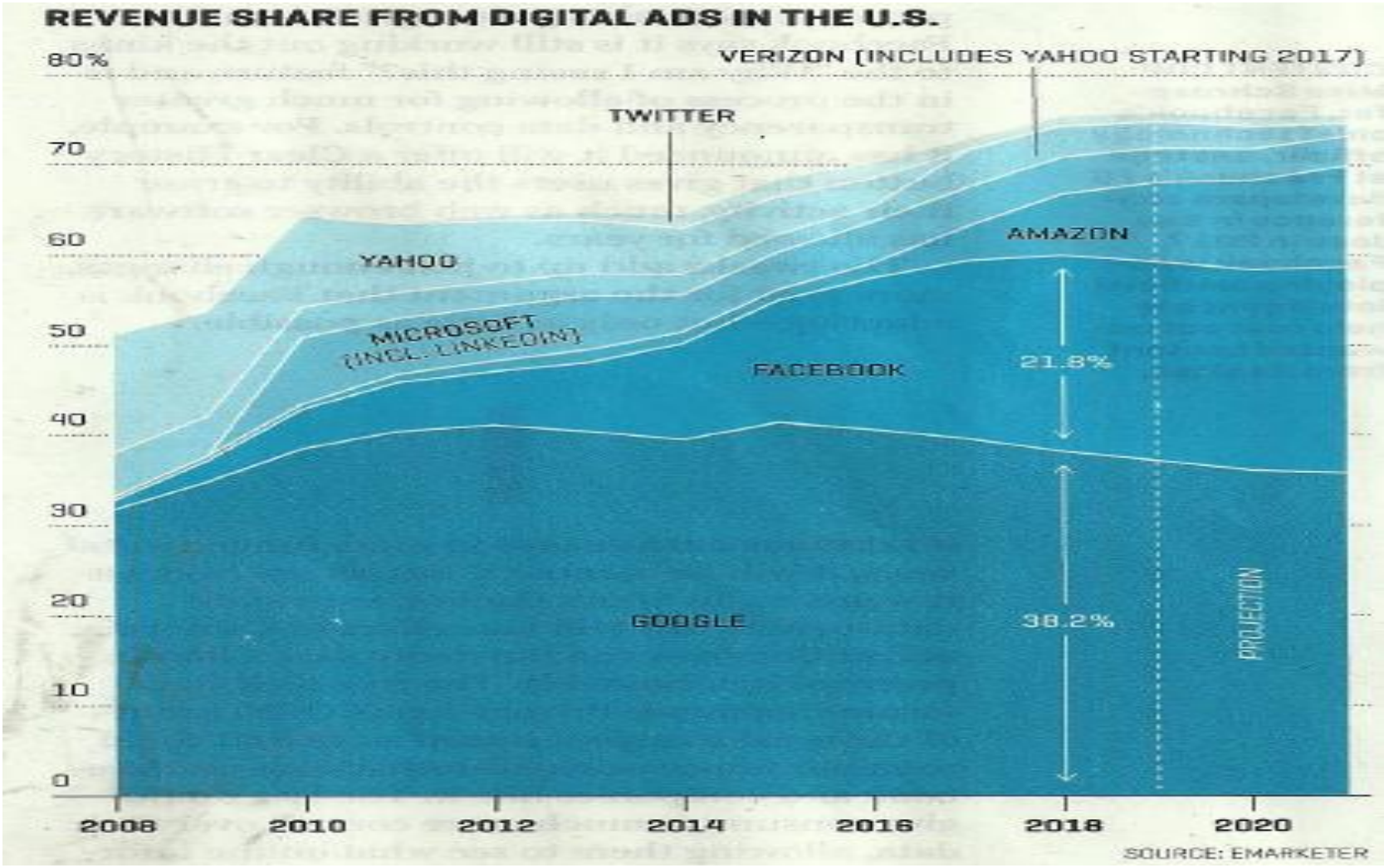
Digital Marketing

- US advertisers now spend more for digital adds than all other media (TV, radio, print, etc.) about $100 billion- growing 19% annually
- Internet advertising is growing at 35% per year versus 5% for TV
- 37% of digital ads go to Google and 21% to Facebook, with Amazon and Twitter getting most of the rest
- Mobile phone and video ads are growing the fastest
- Soon there will be live chats in which robot salespersons swap instant messages with web/smartphone users about products/services

US: Traditional vs Digital Marketing

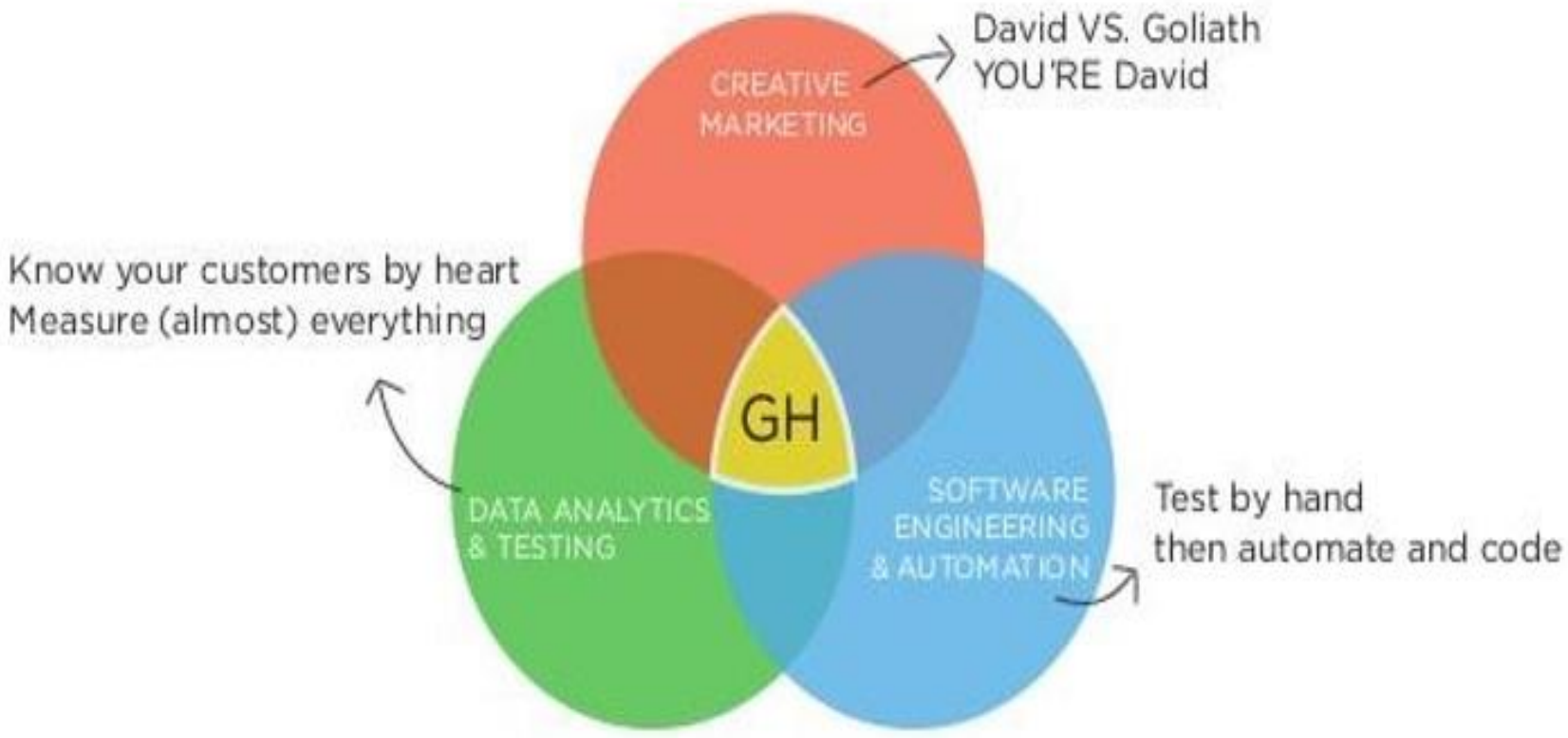


Digital Marketing Major Players



Digital Marketing Environment

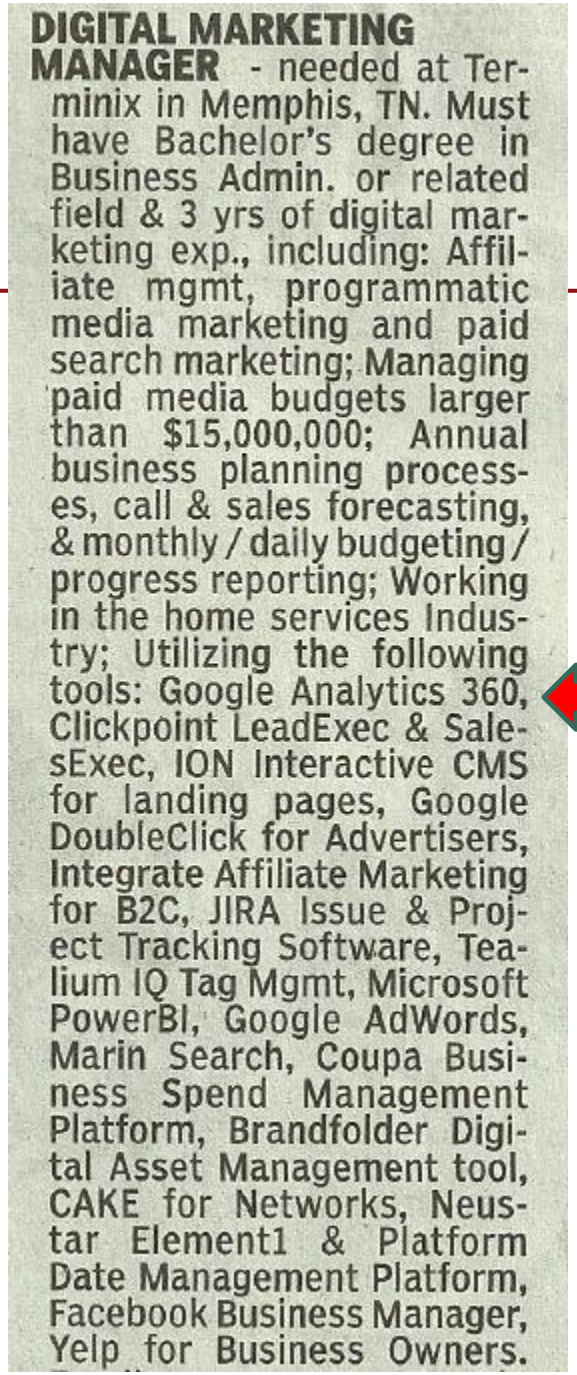
What is Growth Hacking ?



Growth Hacking [Wikipedia]

- **Growth hacking** is a process of rapid experimentation across marketing funnel, product development, sales segments, and other areas of the business to identify the most efficient ways to grow a business
- A growth hacking team is made up of marketers, developers, computer engineers and product managers that specifically focus on building and engaging the user base of a business
- Growth hackers often focus on digital marketing rather than traditional marketing, e.g. using social media, viral marketing or targeted advertising instead of buying advertising through more traditional media such as radio, newspaper, and television

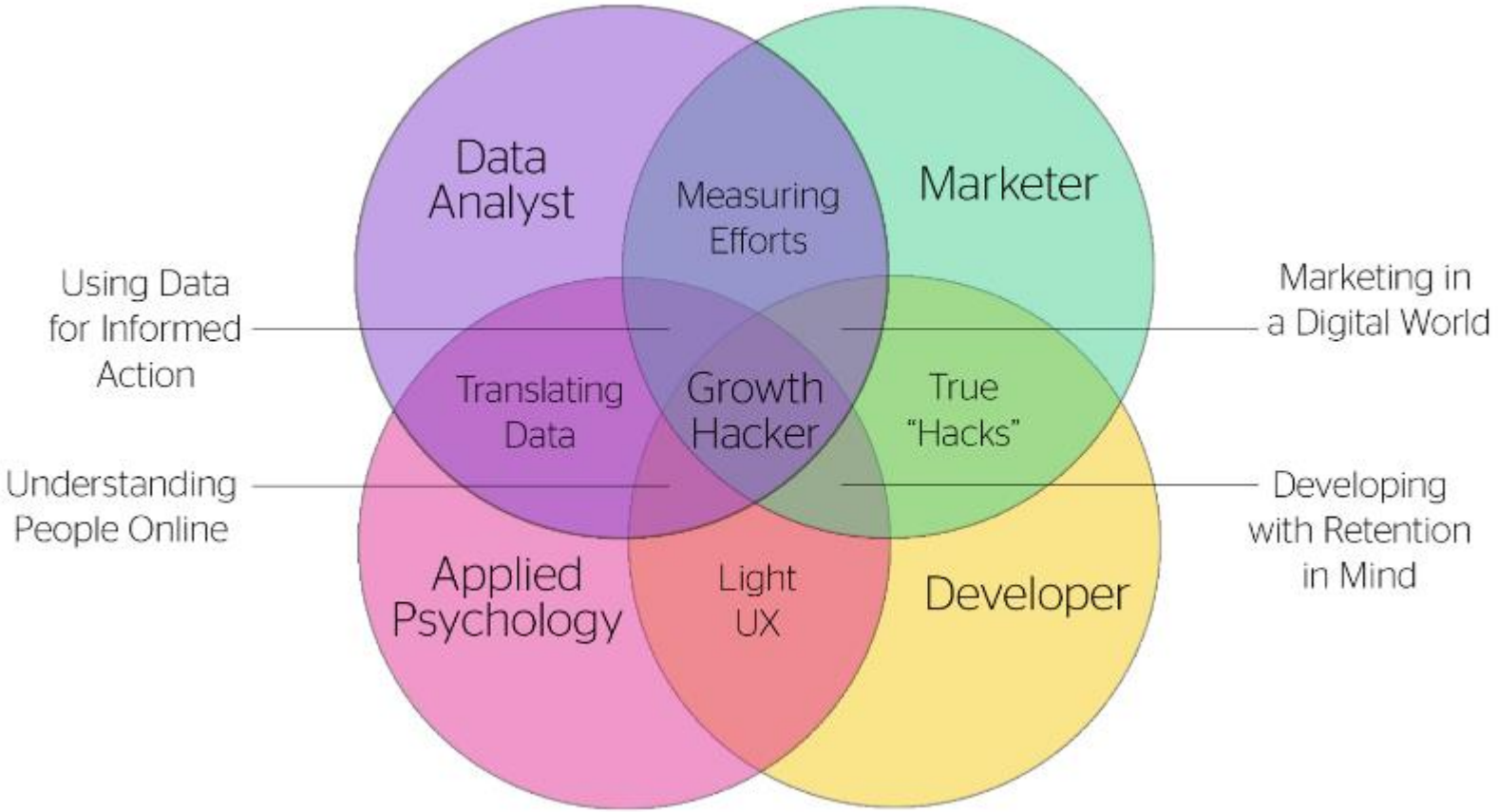
Memphis Commercial Appeal Ad



DIGITAL MARKETING MANAGER - needed at Terminix in Memphis, TN. Must have Bachelor's degree in Business Admin. or related field & 3 yrs of digital marketing exp., including: Affiliate mgmt, programmatic media marketing and paid search marketing; Managing paid media budgets larger than $15,000,000; Annual business planning processes, call & sales forecasting, & monthly / daily budgeting / progress reporting; Working in the home services Industry; Utilizing the following tools: Google Analytics 360, Clickpoint LeadExec & SalesExec, ION Interactive CMS for landing pages, Google DoubleClick for Advertisers, Integrate Affiliate Marketing for B2C, JIRA Issue & Project Tracking Software, Tealium IQ Tag Mgmt, Microsoft PowerBI, Google AdWords, Marin Search, Coupa Business Spend Management Platform, Brandfolder Digital Asset Management tool, CAKE for Networks, Neustar Element1 & Platform Date Management Platform, Facebook Business Manager, Yelp for Business Owners.

Sophisticated marketers who deploy a complete marketing analytics stack are 39% more likely to see improvement in the overall performance of their marketing programs -Forrester and Google
https://www.thinkwithgoogle.com/marketing-resources/data-measurement/data-driven-marketing-technology-analytics-integration/

Growth Hacking Environment



The Great Digital Convergence

We are in a convergence of three powerful, technological forces:

(1) Cheap and ubiquitous computing devices - processors & memory)

(2) Low-cost, high bandwidth

(3) Open standards

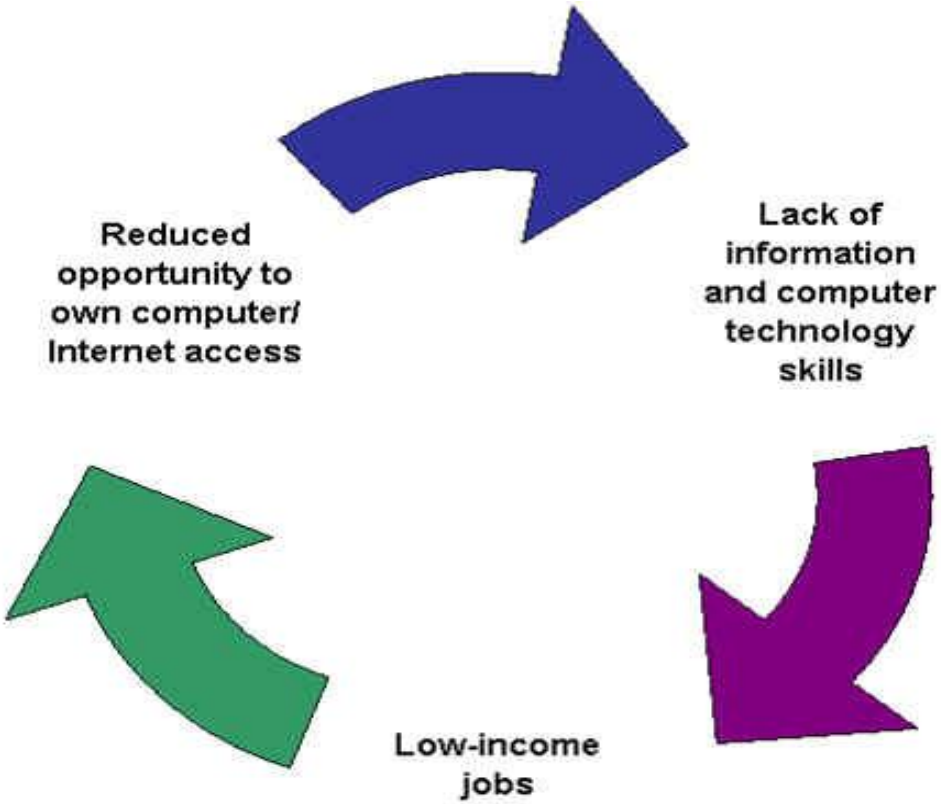
Web 1 was about connecting computers

Web 2 is about connecting people !

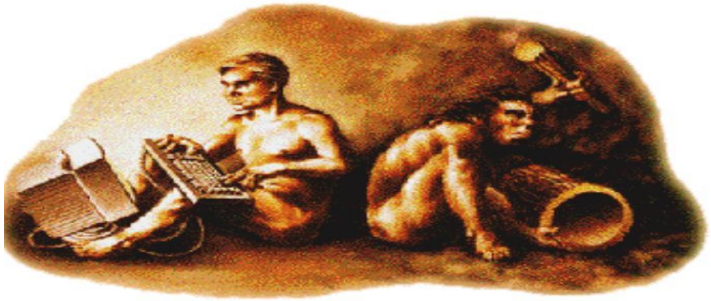
The Great Convergence (continued)

In essence, we have (or soon will have) computing everywhere and anywhere, anytime and all the time, with access to virtually limitless amounts of information, services, and entertainment

Digital Divide



Not too far in the future, there may only be knowledge workers and "mac-workers"; the middle class may disappear!



Information Overload

The Internet of Everything

- The Internet of Everything (IoE)
  - People, processes, data, and things are interconnected via the Internet using various means
- Internet of Things (IoT)
  - Devices that are connected to the Internet and to all the other devices
- Internet of Me (IoM)
  - Subset Internet that gathers and processes information for a given user from the IoT

The Internet of Things (IoT)

Industrial Internet of Things

Transportation

Heavy Machinery

Utilities

Logistics

Healthcare

Manufacturing

Consumer Internet of Things

Home Automation

Appliances

Home Monitoring

Phones

Wearables

TVs

Network Connectivity

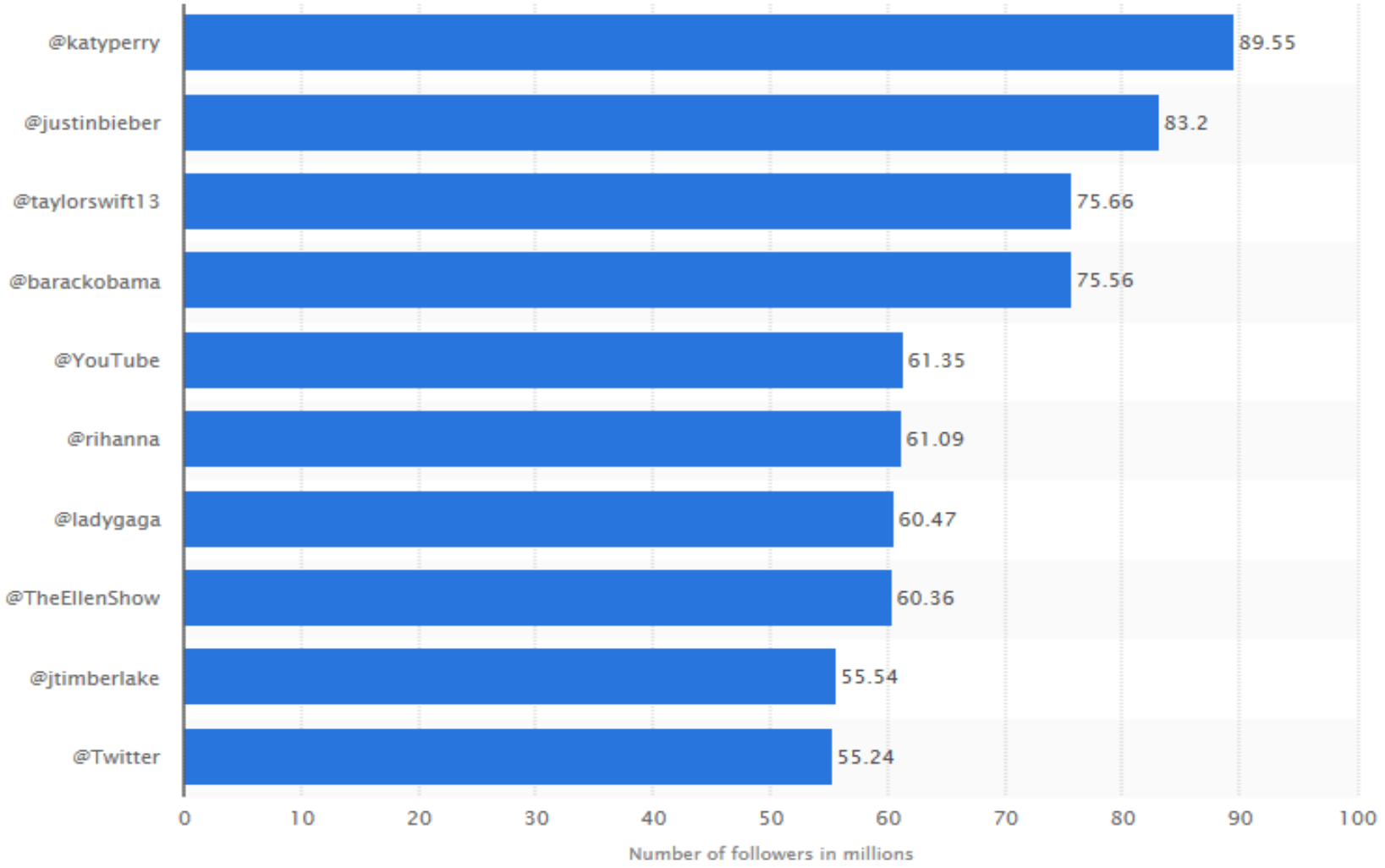
Data Analytics

"Network" Power

- Business power is more and more being determined by the size of an organization's networked users
- Apple, Microsoft, Google, and Facebook have over 1 billion combined users
  - Facebook has 85% share of the social network
  - Google controls 65% of the search market (80% if China is excluded)
  - Microsoft has 90% of the desktop market

Twitter Followers

[Pope Francis has about 20 million Twitter followers, Trump has about 50 million followers]



New Economy vs. Old Economy

Example	Old	New
Buying and selling text books	Visit the bookstore	Visit web site for publishers and retailers - also eBooks
Registering for classes	Walk around campus to Departments, Registrar's office, etc.	Access campus web site
Photography	Buy film, use camera, take picture, take it for processing	Use digital camera or cell phone
Paying for Gasoline	Fill up your car, go inside, pay cash or credit card	Use speed pass token wave over the sensor and go
Paying the Transportation	Pay cash, metal tokens	Metro and electronic cards
Paying for goods	Visit store, take the item, pay , go	Use self – service kiosks
Local transportation	Taxi	Uber or Lyft

New Economy vs. Old Economy

- Example #1: Registering for Classes
  - Old Economy: You would go to the Registrar's Office on campus with a paper registration document
  - New Economy: You access your campus Web site, log into registration site, and electronically register for classes from anywhere
- Any Problems ?

New Economy vs. Old Economy

- Example #2: Buying and Selling Textbooks
  - Old Economy: You go to the bookstore in person and buy new or sell used books
  - New Economy: You go online to the Publisher's Web site or to Web-based services such as Amazon.com to buy or sell books
- Any Problems ?

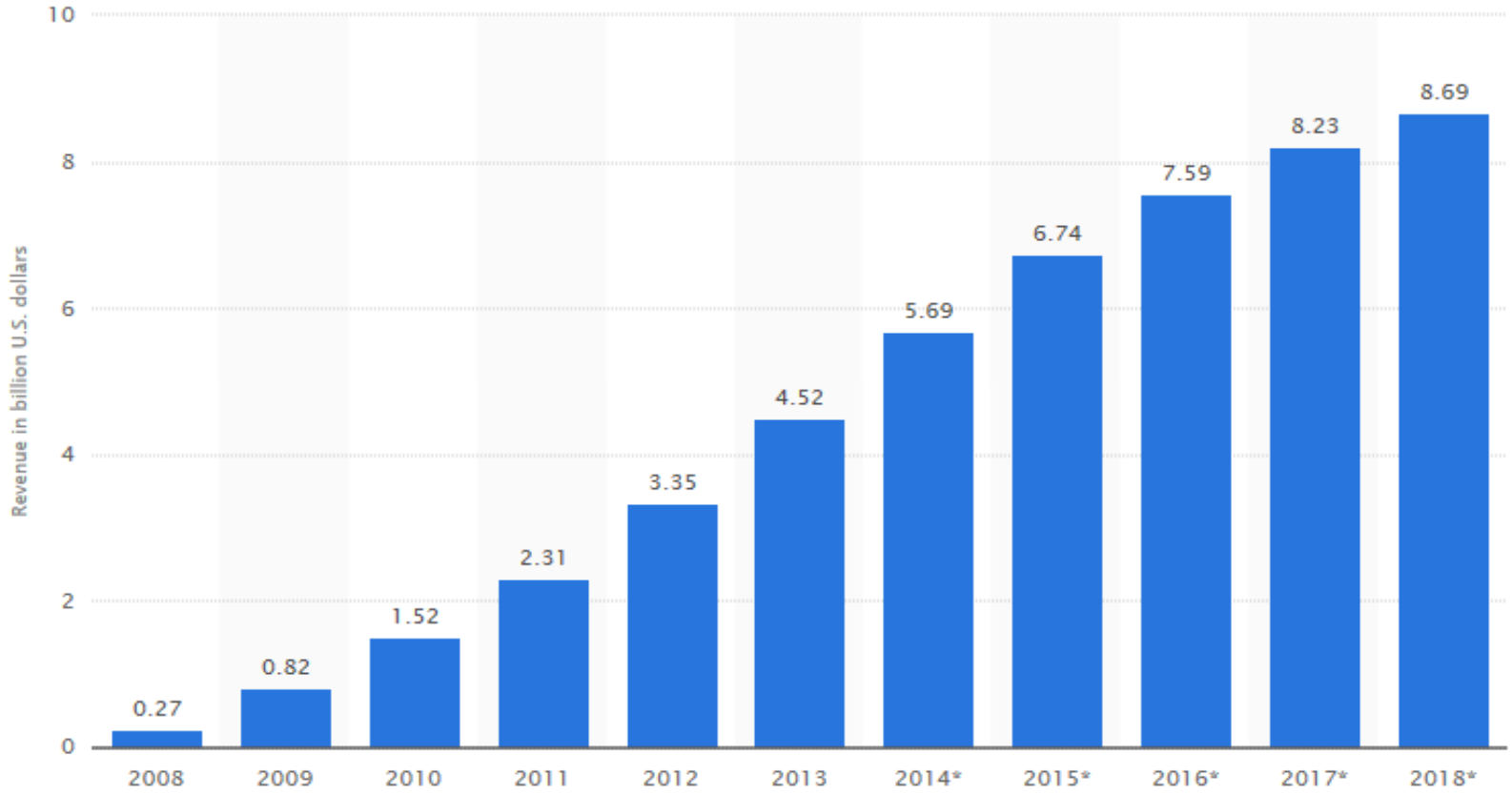
2010 – Last Year for Dominance of Physical Books

- Barnes & Noble, the nations largest bookstore chain, announced it sold 1 million e-books Christmas day 2010
- Amazon began seeing e-books outsell print best sellers in October of 2010
- Millions of iPads, Kindles, and Nooks were sold for Christmas 2010
- iPad sold 1 million in its first month, 20 million in 2010
- Overall more books, both print and digital are being sold; but the average hardcover costs $15.50, while the average e-book is $8.75

E-Books & Tablets

- E-book versions of the top six books outsold the print versions starting in January of 2011
- Instant on
- Faster, smaller, lighter
- Book search, index, contents
- Network access (both Wi-Fi and cellular)
- Finger movements and controls beyond just pointing
  - Cameras
  - Music
  - Video
  - Social interfaces
  - Apps

US E-book Sales



New Economy vs. Old Economy

- Example #3: Photography
  - Old Economy: You use a camera with film, which you have to purchase and have developed; you postal mail copies of pictures.
  - New Economy: You can scan photos, make copies and e-mail them. Digital cameras require no film or processing. Digital photography and video integrated into cell phones for immediate viewing.
- Any Problems ?

New Economy vs. Old Economy

- Example #4: Paying for Gasoline
  - Old Economy: You pump your gas and go inside to pay using cash or credit
  - New Economy: Insert credit card at pump, receive authorization, pump gas, receive receipt, drive away. Another example is Speedpass and other no-touch technologies
- Any Problems ?

New Economy vs. Old Economy

- Example #5: Paying for Transportation
- Old Economy:
  - Using tokens for buses, subway, etc.
  - Stopping at toll booths on roads

- New Economy:
  - Bus and subway riders now use MetroCards, contactless cards that have a small radio transmitter that transmit account information to a reader
  - Cars have “transponder” cards on windshields that send radio signal to electronic toolbooth

FAST LANE

- MassDOT's Electronic Toll Collection Program
- FAST LANE is operational on the entire Massachusetts system
- FAST LANE is also operational anywhere E-ZPass is accepted
- FAST LANE provides customers with electronic toll collection through the use of a transponder (tag)
- A transponder is a small electronic device that attaches to the inside of your windshield
- As you pass through a designated FAST LANE, a green "Thank You" light will flash to verify your transaction is being approved and recorded to your FAST LANE account
- Assign a FAST LANE account to a credit card which is then charged $20 to open the account. Tolls are automatically deducted from that $20. When the account falls below a balance of $10, the credit card is automatically charged to bring the account balance back to $20. You may also have tolls automatically deducted from a checking account.

New Economy vs. Old Economy

- Example #6: Paying for Goods, Checkout
- Old-old-old Economy: Customer selects goods, waits in line for the cashier to key in price of items, and then pays in cash
- Old-old Economy: The clerk swipes the barcode of each item and customer pays in cash, credit, debit. Information scanned is available for immediate analysis known as *source-data automation*

New Economy vs. Old Economy (Ex. #6 Con't)

- Old Economy: Shoppers take their items to a self-service kiosk and swipe the barcodes themselves
- New Economy: Wireless technology affixed to each item that pass through a scanner that reads wireless signals, generates a bill, automatically debits your designated account for payment
- Any Problems ?

New Economy vs. Old Economy (Taxi vs Uber)

- Upon arrival in Atlanta, I called a traditional cab company to take me from the airport to my hotel. Forty-five minutes later, my cab finally arrived. Remember the first Dodge Caravan minivans with the fake wood paneling? This was my cab, a relic of the 80's.
- When I gave the driver the name of the hotel, just 15 minutes from the airport, he handed me his old-school GPS so I could punch in the address *for him*. After some other difficulties and missed turns, we finally arrived at my hotel. I vowed to try something different for the return trip as this had not been a great customer experience.

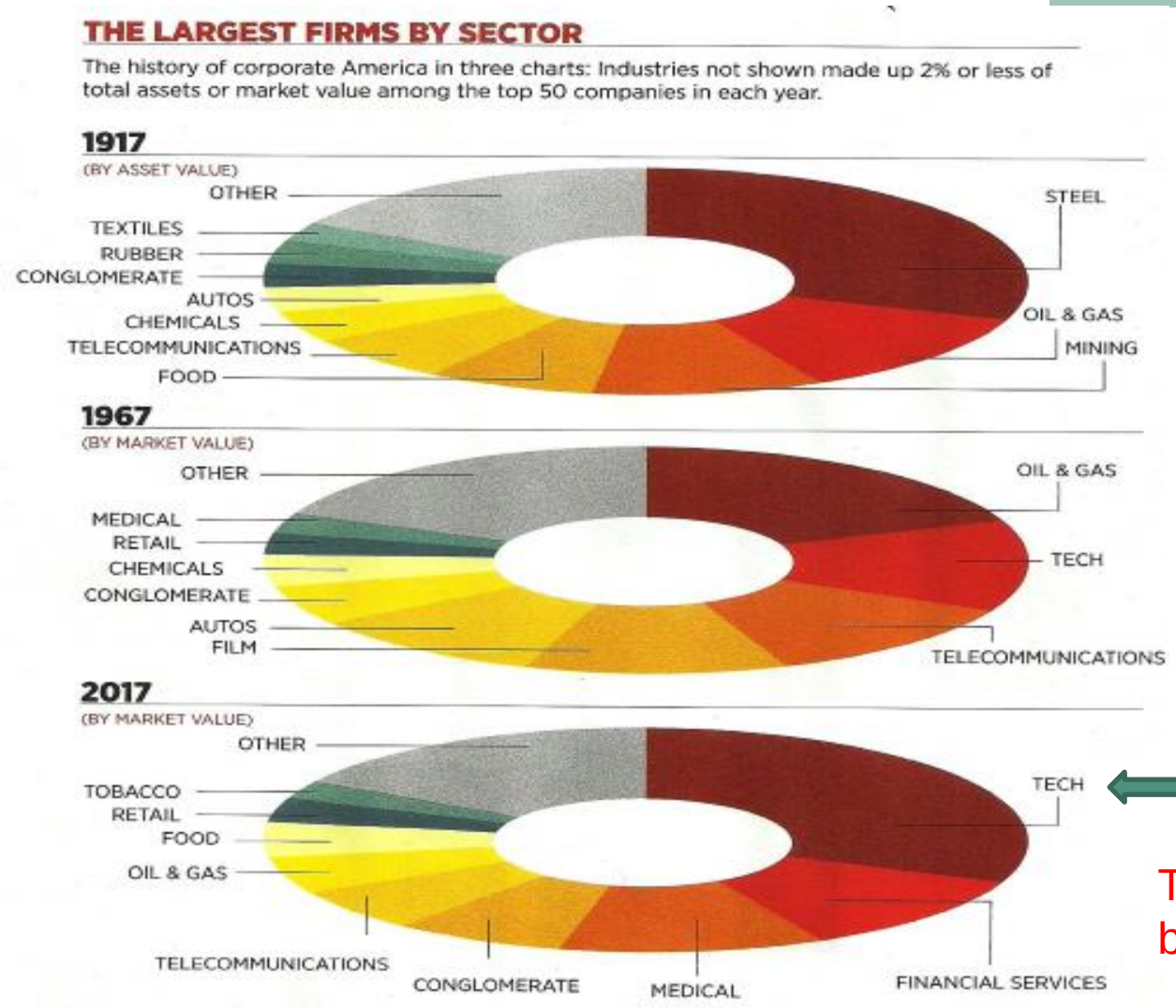
Taxi vs Uber (con't)

- After my business was over the next day, I decided it was time to try Uber. I accessed the app on my smartphone and summoned a driver. Within 10 seconds, my phone was ringing as the driver let me know he was entering the hotel grounds. Sixty seconds later, a very nice, clean SUV (no wood paneling) pulled up in front of the hotel and I was off. Compare that 70-second service to the agonizing 45-minute taxi wait.
- The driver was friendly. The vehicle was new. I didn't have to dig for cash or ask the driver if he takes American Express as my payment information was already in the Uber system and payment was automatic without any interaction with the driver. No paper receipt was necessary as it was emailed to me. I simply hopped out of the vehicle, grabbed my bags, and I was on my way
  - Actual document experience in 2016

Businesses/Jobs Disappearing

- **Video Postproduction Services**
- **Newspaper Publishing**
- **Apparel Manufacturing**
- **Textile Mills**
- **Formal Wear and Costume Rental**
- **Record/CD/DVD Store**
- **Video Rental**
- **Local Photoshop**
- **Manufactured Homes**
- **Wired Telecommunications Carriers**

Growth of Tech Sector



No tech

Some tech

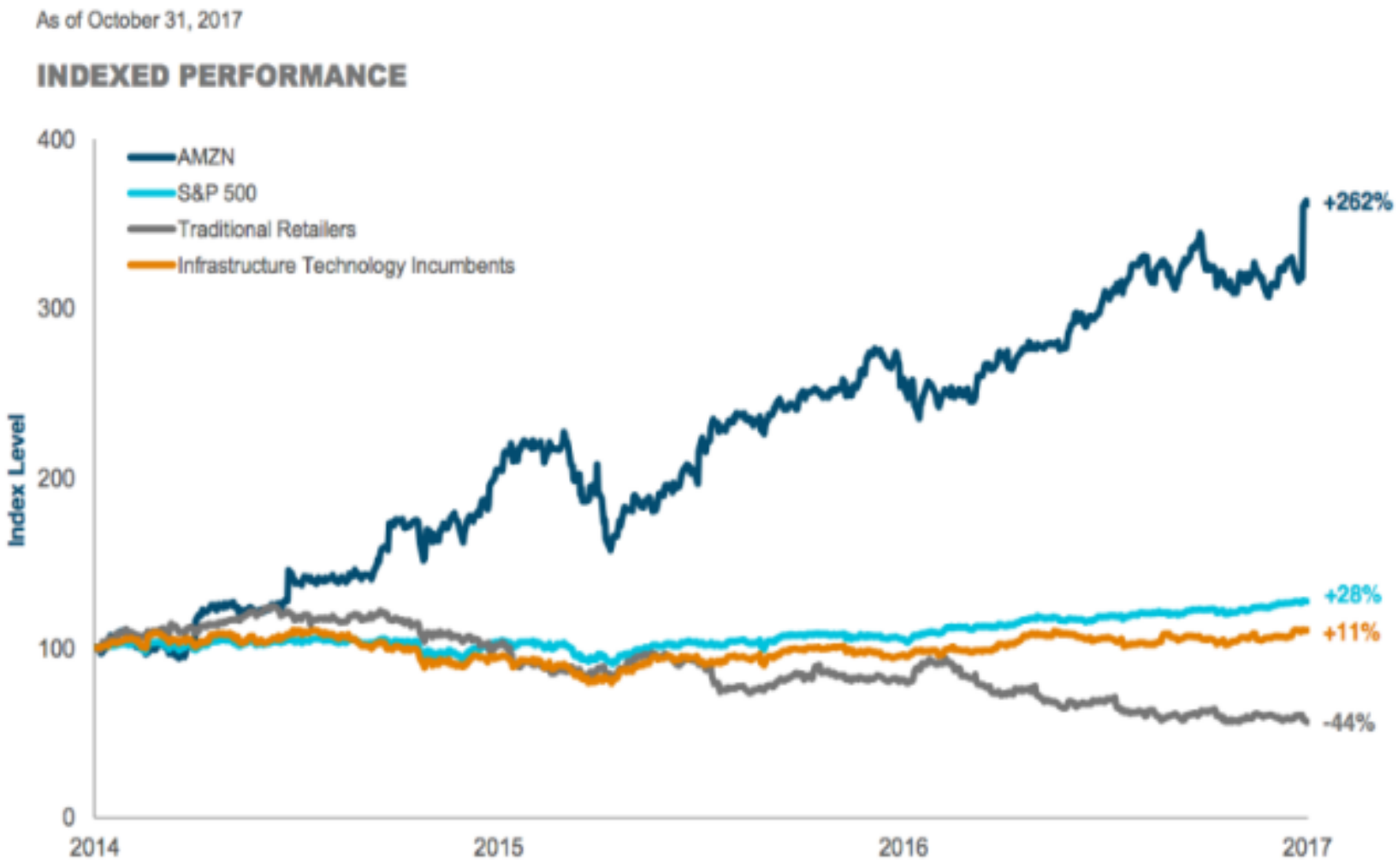
Tech is biggest sector

America's Top Companies

	Company | Industry	Mkt. Cap.[1]
1	**APPLE** | Tech	$768.2 BIL
2	**ALPHABET** | Tech	$604.7
3	**MICROSOFT** | Tech	$600
4	**AMAZON** | Tech	$474.5
5	**BERKSHIRE HATHAWAY** | Conglomerate	$431.9
6	**FACEBOOK** | Tech	$401.2
7	**JOHNSON & JOHNSON** | Medical	$357.5
8	**EXXON MOBIL** | Oil & Gas	$339.1
9	**JPMORGAN CHASE** | Financial Services	$326.1
10	**WELLS FARGO & CO.** | Financial Services	$267.9
11	**WAL-MART** | Retail	$241.1
12	**AT&T** | Telecom	$239.5
13	**BANK OF AMERICA** | Financial Services	$237.6
14	**PROCTER & GAMBLE** | Consumer Goods	$231.6
15	**VISA** | Financial Services	$222.3
16	**GENERAL ELECTRIC** | Conglomerate	$221.7
17	**CHEVRON** | Oil & Gas	$206.9
18	**ORACLE** | Tech	$206.5
19	**PFIZER** | Medical	$197.9
20	**VERIZON** | Telecom	$197.4
21	**COCA-COLA** | Food	$195.5
22	**COMCAST** | Telecom	$190.3
23	**CITIGROUP** | Financial Services	$188.5
24	**UNITEDHEALTH GROUP** | Insurance	$184.8
25	**PHILIP MORRIS INTERNATIONAL** | Tobacco	$181.3
26	**HOME DEPOT** | Retail	$178.9
27	**MERCK** | Medical	$174.7
28	**WALT DISNEY** | Media	$172
29	**INTEL** | Tech	$166.7
30	**PEPSICO** | Food	$166.6
31	**CISCO** | Tech	$157.3
32	**BOEING** | Aerospace & Defense	$143.3
33	**INTL BUSINESS MACHINES** | Tech	$134.8
34	**MASTERCARD** | Financial Services	$134.1
35	**AMGEN** | Medical	$127.3
36	**MCDONALD'S** | Food	$125.7
37	**ALTRIA** | Tobacco	$124.6
38	**3M** | Conglomerate	$120.1
39	**ABBVIE** | Medical	$111.3
40	**KRAFT HEINZ** | Food	$106.5
41	**CELGENE** | Medical	$105.9
42	**HONEYWELL** | Conglomerate	$103.8
43	**CHARTER COMMUNICATIONS** | Telecom	$101.1
44	**PRICELINE** | Tech	$99.7
45	**GILEAD SCIENCES** | Medical	$99.4
46	**NVIDIA** | Tech	$96.7
47	**SCHLUMBERGER** | Oil & Gas	$95.3
48	**UNITED TECHNOLOGIES** | Aero & Defense	$94.7
49	**BRISTOL-MYERS SQUIBB** | Medical	$93.3
50	**ELI LILLY** | Medical	$91

[1]As of July 31, 2017.

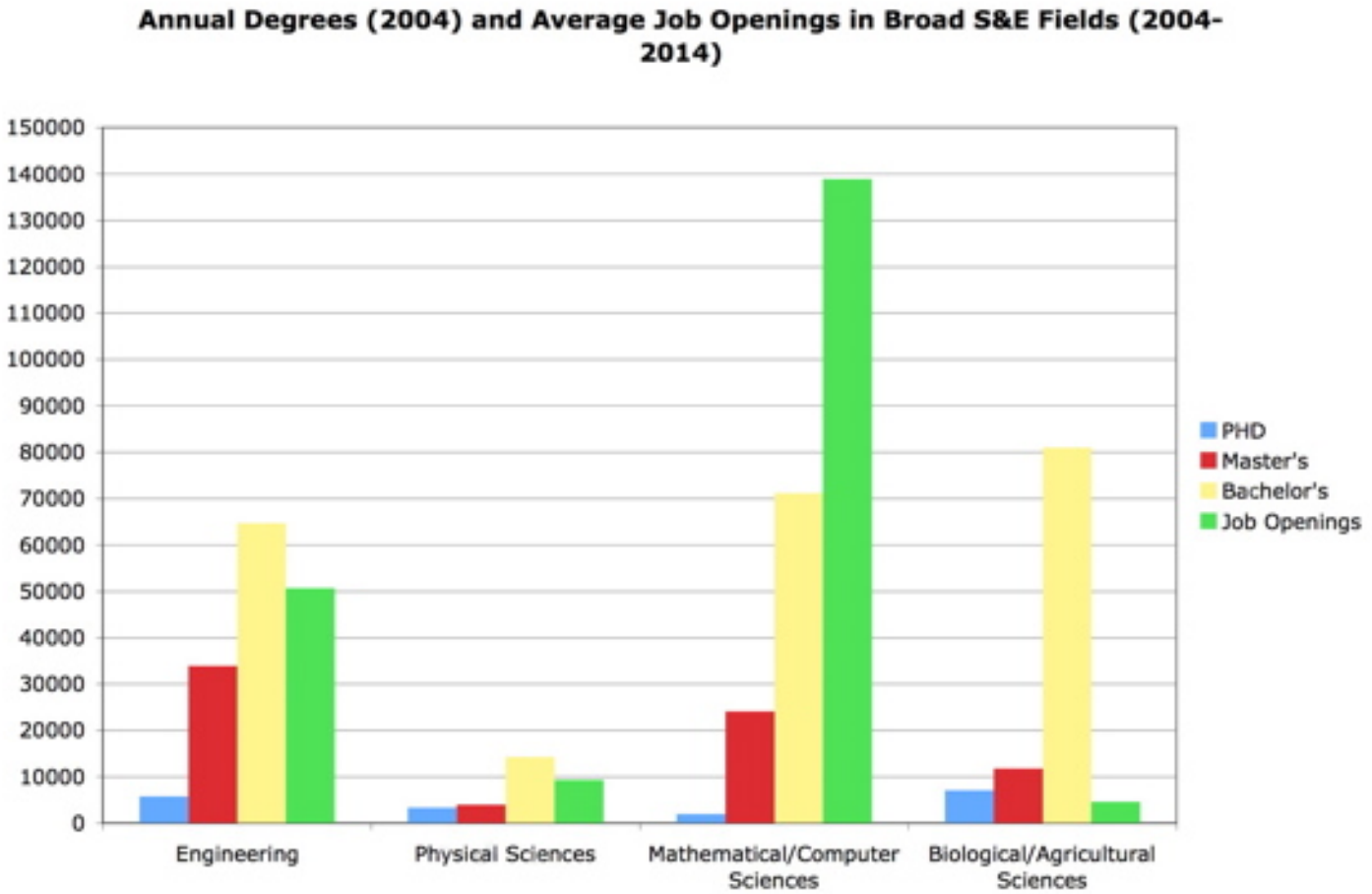
Amazon vs Brick & Mortar



“Demand for IT Jobs Will Soar”

- Five IT specialties are among the 25 fastest-growing jobs, according to a new forecast from the U.S. Department of Labor's Bureau of Labor Statistics
- Positions in networks, data communications, cyber security analysis will increased over 50 percent between 2006 and 2016, the highest rate of growth of any occupation
- Computer software application engineers will see the fourth-highest growth, with an increase of 44 percent
- Computer systems analysts (29%), database & data scientists (29%) and computer systems software engineers (28%) also rank in the top 25 jobs in terms of job growth
- Other IT occupations expected to see increase growth include network and computer systems administrators, computer and information research scientists, computer information systems managers and computer support specialists

Science and Engineering Jobs in Coming Decade



The Kiplinger Letter

FORECASTS FOR EXECUTIVES AND INVESTORS

1100 13th Street NW, Washington, DC 20005 • kiplinger.com • **Vol. 93, No. 23**

Dear Client:

Washington, June 10, 2016

Lots of fretting about jobs these days... especially given the slowing trend in hiring since Feb., as amplified by the paltry 38,000 jobs added in May, and the many people who've given up looking for work.

Adding to the concerns and overall angst: The relentless march of automation... robots and other productivity-enhancing machines that will continue to displace people in the workplace.

Folks without skills will take the biggest hit. Coming increases in the minimum wage in many states and cities are sure to advance employers' efforts to automate low-skill jobs...parking lot attendants, order takers, front counter workers and the like.

JOBS

But for skilled workers, the future is bright. May's job report is noteworthy for occupations that are not affected by the slowdown in hiring... chiefly tech, accounting, consulting and health care.

In fact, employers find it hard to fill many jobs in fields that require sophisticated technical skills along with an ability to communicate effectively while leading and influencing teams of colleagues.

ECONOMIC FORECASTS

GDP growth
Accelerating in second-half '16; 2% for the year

Interest rates
10-year T-notes at 2.1% by end '16; 30-year mortgages at 3.9%

Inflation
2.4% by end '16, up from 0.7% at end '15

Unemployment
Ending '16 at 4.7%, where the rate is now

Crude oil
Trading from $40 to $45/bbl. by July 4

Disposable income
Rising 2.9% in '16 vs. 3.4% in '15, after adjusting for inflation

Complete economic outlook at **kiplinger.com/outlooks**

Successful implementation of technology requires a slew of experts in well-compensated positions, ranging from big data and cybersecurity specialists to software and mobile app developers. Also computer network administrators, systems engineers, programmers of all stripes and wireless network engineers.

Greater use of digitized video for marketing and more is opening up jobs in motion graphics and customer experience design, marketing automation and other specialties that didn't exist a few years ago. Recent college grads and others that specialize in such fields are often seeing multiple offers from top-notch firms.

COMMENTARY

I already live in the future — and you should, too

By Vivek Wadhwa
Special to The Washington Post

I live in the future.

I drive a Tesla electric vehicle, which controls the steering wheel on highways. My house in Menlo Park, California, is a "passive" home that expends minimal energy on heating or cooling. With the solar panels on my roof, my energy bills are close to zero — and that includes charging the car. My iPhone is encased in a cradle laced with electronic sensors that I can place against my chest to generate a detailed electrocardiogram. Because I have a history of heart trouble, including a life-threatening heart attack, knowing that I can communicate with my doctors in seconds is a comfort.

I spend much of my time talking to entrepreneurs and researchers about breakthrough technologies, such as artificial intelligence and robotics. These entrepreneurs are building a better future, often at a breakneck pace. One team built in three weeks a surgical-glove prototype that delivers tactile guidance to doctors during examinations. Another built visualization software that tells farmers the health of their crops using images taken by off-the-shelf video cameras flown on drones. That technology took four

FUTURE
from 1C

weeks to develop. You get the idea. I do, in fact, live in the future as it is forming. It is forming far faster than most people realize, and far faster than the human mind can comfortably perceive.

In short, the distant future is no longer distant. The pace of technological change is rapidly accelerating, and those changes are coming to you very soon, whether you like it or not.

Such rapid, ubiquitous change has, of course, a dark side. Many jobs as we know them will disappear. Our privacy will be further compromised. Future generations may never drive a car or ride in one driven by a human being. We have to worry about biological terrorism and killer drones. Someone you know — maybe you — will have his or her DNA sequence and fingerprints stolen. Man and machine will begin to merge into a single entity. You will have as much food as you can possibly eat, for better and for worse.

The ugly state of politics in the United States and Britain illustrates the impact of income inequality and the widening technological divide. More and more people are being left behind by innovation and they are protesting in every way they can. Technologies such as social media are being used to fan the flames and to exploit ignorance and bias. The situation will get only worse — unless we find ways to share the prosperity we are creating.

We have a choice: to build an amazing future, such as we saw on the TV series "Star Trek," or to head into the dystopia of "Mad Max." It really is up to us; we must tell our policymakers what choices we want them to make. The key is to ensure that the technologies we are building have the potential to benefit everyone equally; balance the risks and the rewards; and minimize the dependence that technologies create. But first, we must learn about these advances ourselves and be part of the future they are creating. That future cannot be ignored.

Simply put, the future is happening faster and faster. It is happening everywhere. Technology is the great leveler, the great uniber, the great creator of new and destroyer of old.

eir eye and alert them to ese locally owned busiesses," Lee said.

Businesses capitalizing n PokeStops within three eeks saw a 25 increase in evenue, according to inmation released for the nel discussion, part of e monthly FedEx Instite of Emerging Innovan Series.

While the game makes illions of users more miliar with augmented ality, panelists at the iversity said the spread virtual reality technoly also is bound to give pectations and developnt a boost.

Holding up a smartone to get information out museum exhibits ing viewed, details out aging equipment ng repaired on a Navy

ship, or more detail while doing textbook homework were a few of the examples that experts gave for the future of augmented reality.

Ernest McCracken, a panelist and application architect for IBM, said that retailers will jump in after one takes the leap.

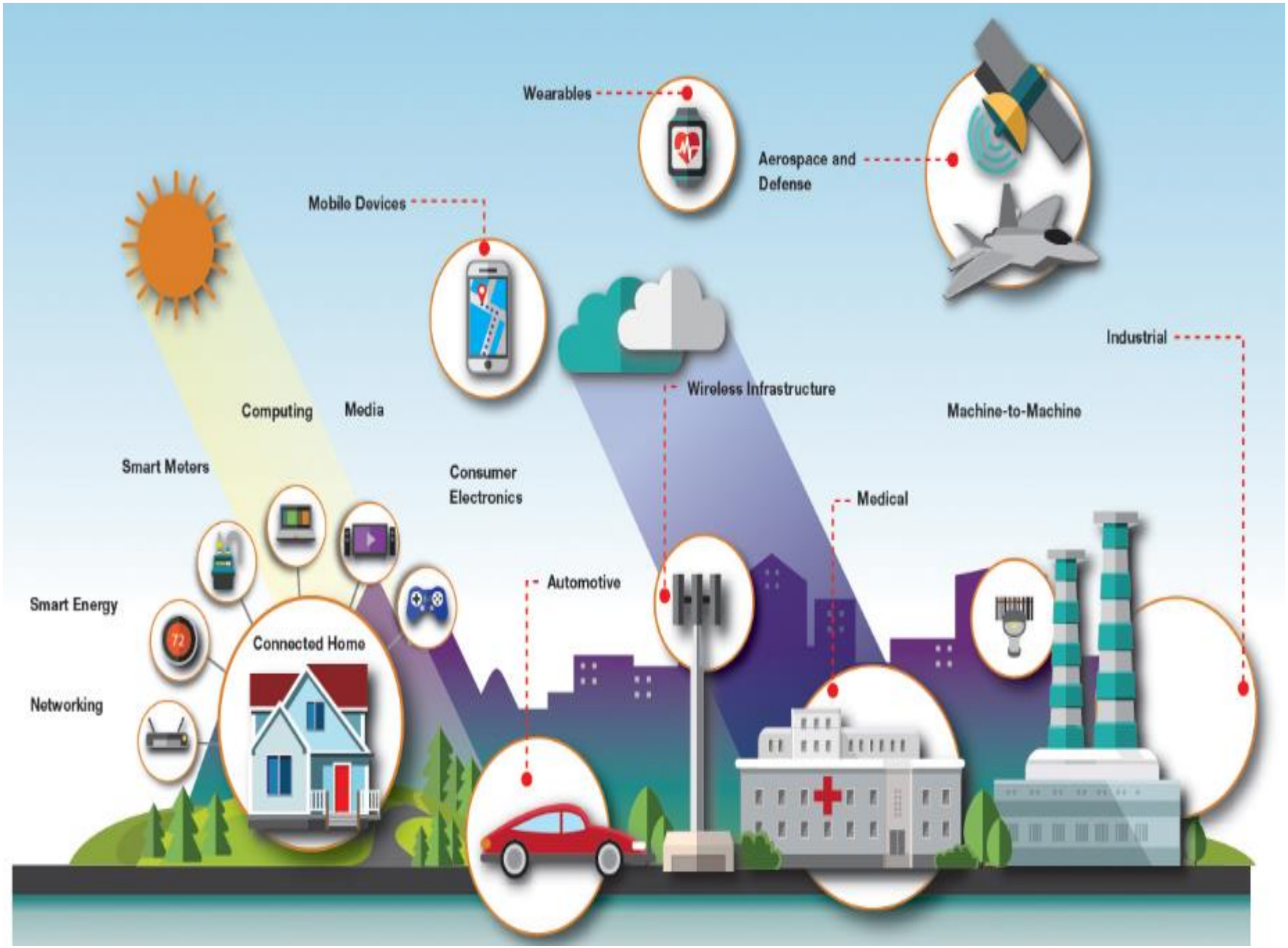
"Let's say Wal-Mart does this to where you can hold your phone up on a product and it will show you all this information about it, or you put it on your phone you're looking for something and it shows you a marker in the store where to go to, and all of the sudden Target says, 'Oh, we need to do that now,' " McCracken said. "And all of the sudden, bam, it's everywhere."

Data Matters !

- You don’t need to be a professionally trained futurist to see that a critical driving force in the global economy for the next 10 years will be DATA:
  - Data exploitation (creation of value with data)
  - Data sharing
  - Data protection
- Data matters, now more than ever

Data Matters (con't)

- When the IoT (Internet of things) becomes dominant, every object will be collecting and sharing data
- Everything will be a source of data:
  - A prototype wearable from Milo Sensors, measures blood alcohol level through your skin
  - Aspiring baseball superstars can use a virtual batting cage in which they practice against a database of every pitch ever thrown by a particular pitcher
- Smart beds will be sharing data with smart thermostats, smart refrigerators will be sharing data with smart product packaging, and smart hairbrushes will be sharing data with human hair brushers


Wearables
Aerospace and Defense
Mobile Devices
Industrial
Wireless Infrastructure
Computing
Media
Machine-to-Machine
Smart Meters
Consumer Electronics
Medical
Automotive
Smart Energy
Connected Home
Networking

Relationships and Data Sharing

- The nature of relationships will change; everything will have a relationship with everything — objects with other objects as well as objects with their human users
- The robots such as Mayfield Robotics' Kuri and LG's Hub Robot, are notable not so much for what they could do as for the relationship their interface enabled — their personality
- The Yui interface of Toyota's "Concept-i" concept car collects data that can tell when the driver is happy or sad and adjust the mood inside
- The NeuV concept vehicle puts Honda on a path that will "enable machines to artificially generate their own emotions"

Data is Power

- For 420 years, no one has challenged Sir Francis Bacon's formulation that knowledge is power
- But today and beyond, data is power
- The differences run deep
- Knowledge is gained through study and experience, and in the processing of data
- Data is merely collected, and in such a quantity that no human mind can begin to contain it
- Those who collect it are divvying up the spoils in a **data cold war**
  - Google is accumulating a data set that reflects what we want to know
  - Amazon what we buy
  - Apple what we listen to and where we go
  - Facebook how we connect

Data Rights

- But who determines:
  - What can be done with that data?
  - Who determines what data will be shared with what devices under which circumstances?
  - Who sets the rules for collecting, managing and acting upon new data such as emotional data?
- Will we need a database to keep track of all the devices we have relationships with, another of which devices have relationships with which other devices, and yet another of data permissions we have granted and revoked?
- A key question looming in the not-so-distant future is how much of machine-to-machine language humans will be able to see or understand

Shift Happens

Summary

- The Internet can be used and accessed via navigational tools, search engines, and directories
- TCP/IP provides many useful e-mail protocols
- Web applications can be used with minimum costs
- Intranet is a network within a firm that uses Internet protocols and technologies
- Extranets are considered a type of interorganizational system (IOS)
- Recent trends include Web 2.0 and Web 3.0
- Individuals, businesses, and governments benefit from IoE technology

Library and Web References

- **Using MIS** by David Kroenke
- **Management Information Systems,** by Kenneth C. Laudon and Jane P. Laudon
- Creating Business Advantage in the Information Age [0-07-252367-0]
- Creating Business Value with Information Technology: Challenges and Solutions [1-59140-038-4]
- Launching New Ventures [0-618-21481-X]

Homework

- Textbook Chapter Seven
- Quiz on this lesson and that chapter
- Download (from online syllabus page) and read "Life in 2030"
  - Email a written discussion of ideas you got from this article that could be used for a competitive advantage in your team's chosen business
- Reconsider the IT competitive analysis portion of your team project