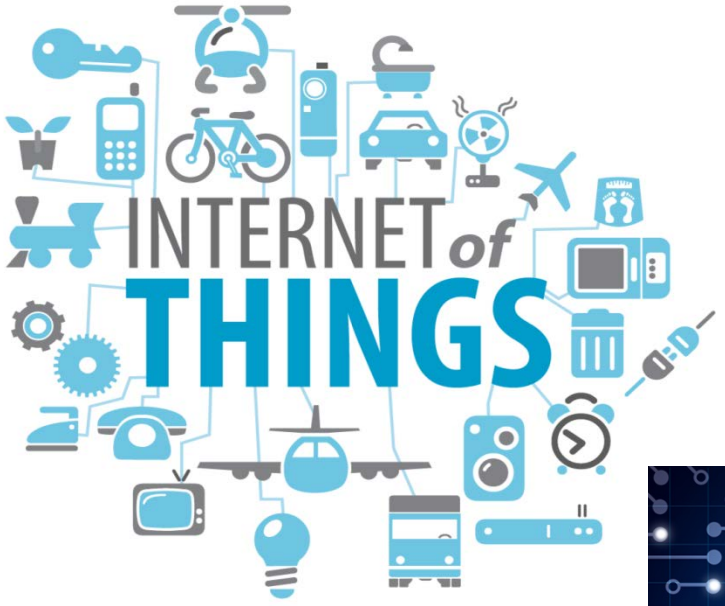
Where are computer networks now?



CE3005/CZ3006 Computer Networks

Lecture 1
Course Logistics and Internet History

Contents

- **Course Logistics**
  - Teaching staff
  - Lecture
  - Tutorial
  - Lab
  - Exam
- **A Brief History of Internet**
  - How this thing gets started

Course Logistics

Teaching Philosophy

TEACH LESS, LEARN MORE

TEACH HOW, LEARN WHAT

Teaching Staff

- **Lecturers**
  - Dr. Jun LUO (Part I)
  - Dr. Rui TAN

  - Dr. Francis LEE (Part II)

Lecture

- **Time/Location**
  - Tuesday 10:30 – 12:30, Online
- **Two Parts**
  - Part I: week 1-3 (Jun Luo)
    week 5-6 (Rui Tan)
  - E-Learning: week 7 (makeup lecture)
  - Part II: week 8-13 (Francis Lee)

- **References**
  - James K. Kurose and Keith W. Ross, *Computer Networking – A Top-Down Approach* (CN)
  - Douglas E. Comer, *Computer Networks and Internets* (CNI)

CE3005/CZ3006 - Part I

- **Focusing on Underlying Layers**
  - Physical layer resilience
  - Data link layer
    - Flow control
    - Error control
  - Local area network
    - MAC
    - Wireless LAN
    - Mobile access
  - Network architecture and performance
    - Network design patterns

Part I Syllabus – Fundamental Underlying Layers

Lecture	Date	Subject
1	11/08/2020	**Introduction**
		Network layer & physical resilience
2	18/08/2020	Data link layer – Flow control
		Data link layer – Error control
3	25/08/2020	Local area network – Introduction
4	01/09/2020	Local area network – MAC
		Local area network – Ethernet
5	08/09/2020	Local area network – WLAN
		Mobile Access Networks: From 1G to 5G
6	22/09/2020	Packet switch network – Network paradigm

CE3005/CZ3006 – Part II

- **Covering Higher-Level Layers**
  - Applications
  - TCP protocol
  - IP protocol (main emphasis)
  - Routing process

Tutorial

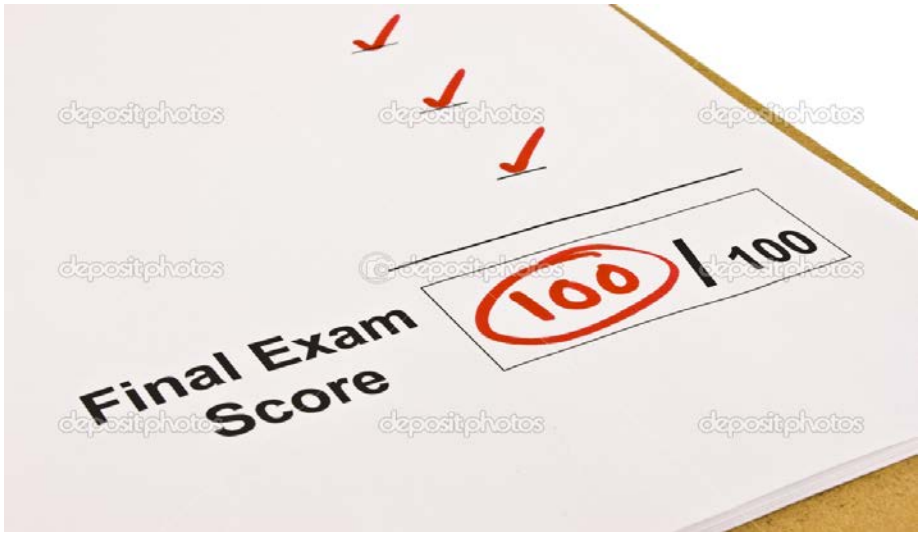
- **Starting from the 3rd week**
  - Try all the problems before the session
- **7 Tutorials for the whole course**
  - 6 for regular sessions
  - 1 for E-learning
- **Problems & Questions**
  - Exam questions from previous years
  - Problems asked by you

Lab

- **Lab schedule**
  - Hardware Lab (CE) and Software Lab (CZ)
  - Starting from 5th week
  - Check your schedule ASAP
- **Lab contents**
  - 3 Lab experiments
  - Labs 3 is the most intriguing: mining Internet traffic data with Python
  - Detailed lab organizations are elaborated in extra slides; please **carefully check them** on course site.

Exam/Grade

- **Two quizzes (0.5 hour each; 40%)**
  - Weeks 7 and 12/13; details will be announced at least two weeks in advance.
  - Each accounts of **20%** of the final mark
- **Five labs (60%)**
  - Labs 1 and 2: each **15%** of the final mark
  - Labs 3: **30%** of the final mark

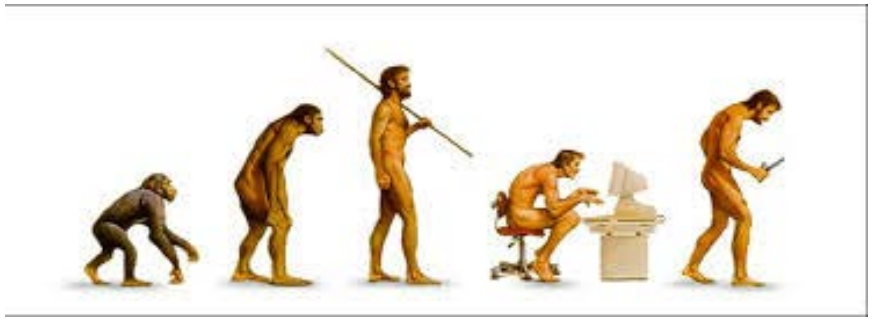


How to ACE this course

- **Attend Tutorial**
- **Attend Lab**
- **Attend Lectures**

- **Keep your eyes open**
- **Keep your ears open**
- **Ask questions**
  - You just talked about …, I am confused about …, can you explain again about …?

History of Internet



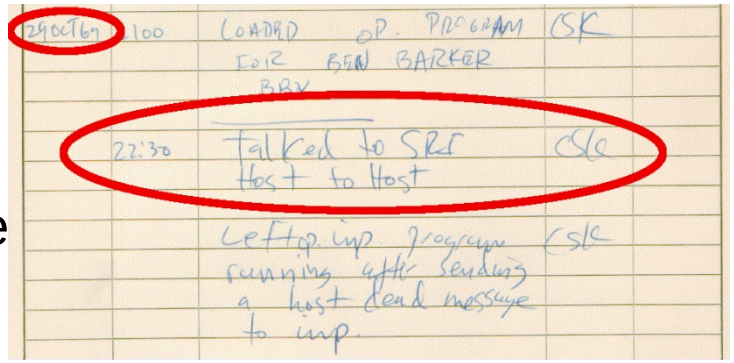
What is the Internet?

- WWW
- ftp
- telnet
- Email
- MSN/Skype
- P2P
- Social networking

An inter-connected infrastructure for information exchanging via standard protocols

Where Did It Come From?

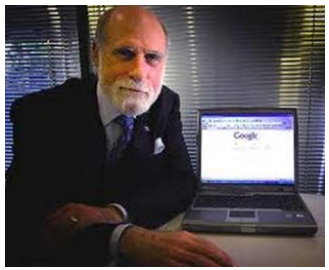
- **Early 1960's - DARPA (ARPA in 1960's) project headed by Licklider**
- **Late 1960's - ARPANET & research on packet switching by Lawrence Roberts**
  - 02/09/1969 – Leonard Kleinrock's computer at UCLA became first node on the ARPANET
  - 29/10/1969 – First packets sent; Charlie Kline attempted use of remote login from UCLA to SRI; system crashed as "G" was entered
  - 05/12/1969 - Four nodes: UCLA, SRI, UCSB, University of Utah



Get more info at:
http://www.isoc.org/internet/history/
http://www.packet.cc/internet.html

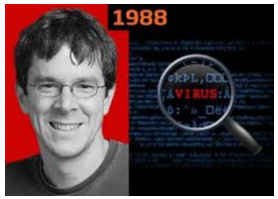
History of Internet

- **1969 – First RFCs by Steve Crocker (http://rfc.sunsite.dk/)**
- **1971 – Email by Ray Tomlinson @ BBN**
- **1970's – Protocol development**
  - 1972-1974 TCP/IP developed by Vint Cerf & Bob Kahn
  - 1973 – Ethernet by Metcalfe @ PARC
  - 1974 TCP draft produced, split into TCP and IP in 1978
- **DNS – Distributed and scalable mechanism for resolving host names into IP addresses**
- **UC Berkeley implements TCP/IP into Unix BSD**
- **1985 – Internet used by researchers and developers**

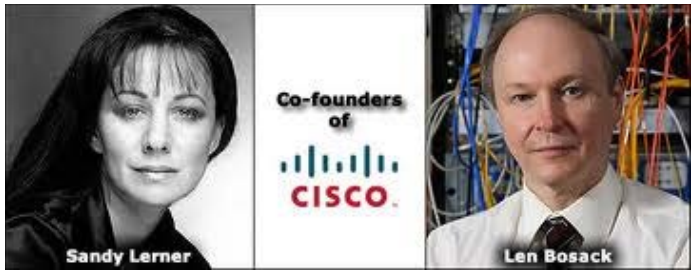


History of Internet

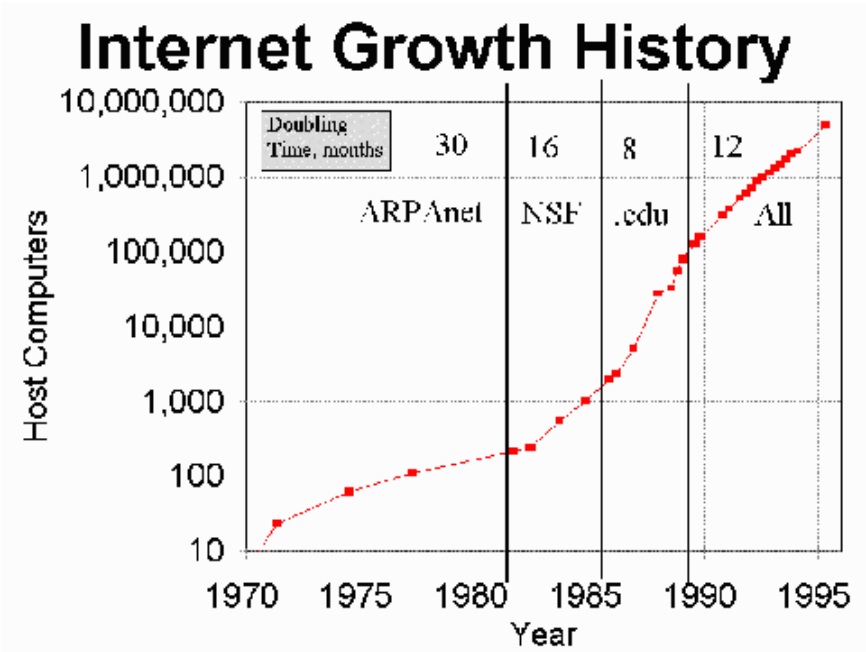
- **November 1988 – Internet worm affecting about 10% of the 60000 computers on the Internet (Robert Morris, Cornell)**
- **Tim Berners-Lee at CERN in 1989**
  - Proposal for WWW in 1990
  - First web page on November 13, 1990

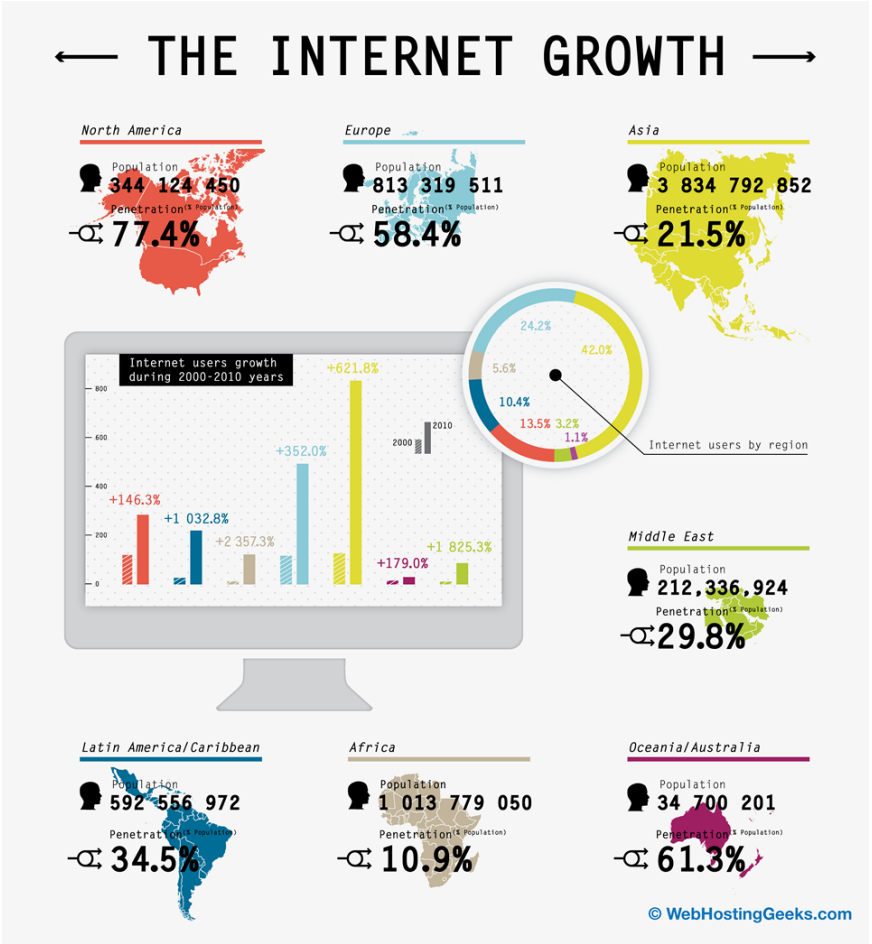


- **Cisco(1984), Google (1998), Facebook(2004), Twitter(2006), Dropbox(2008) …**



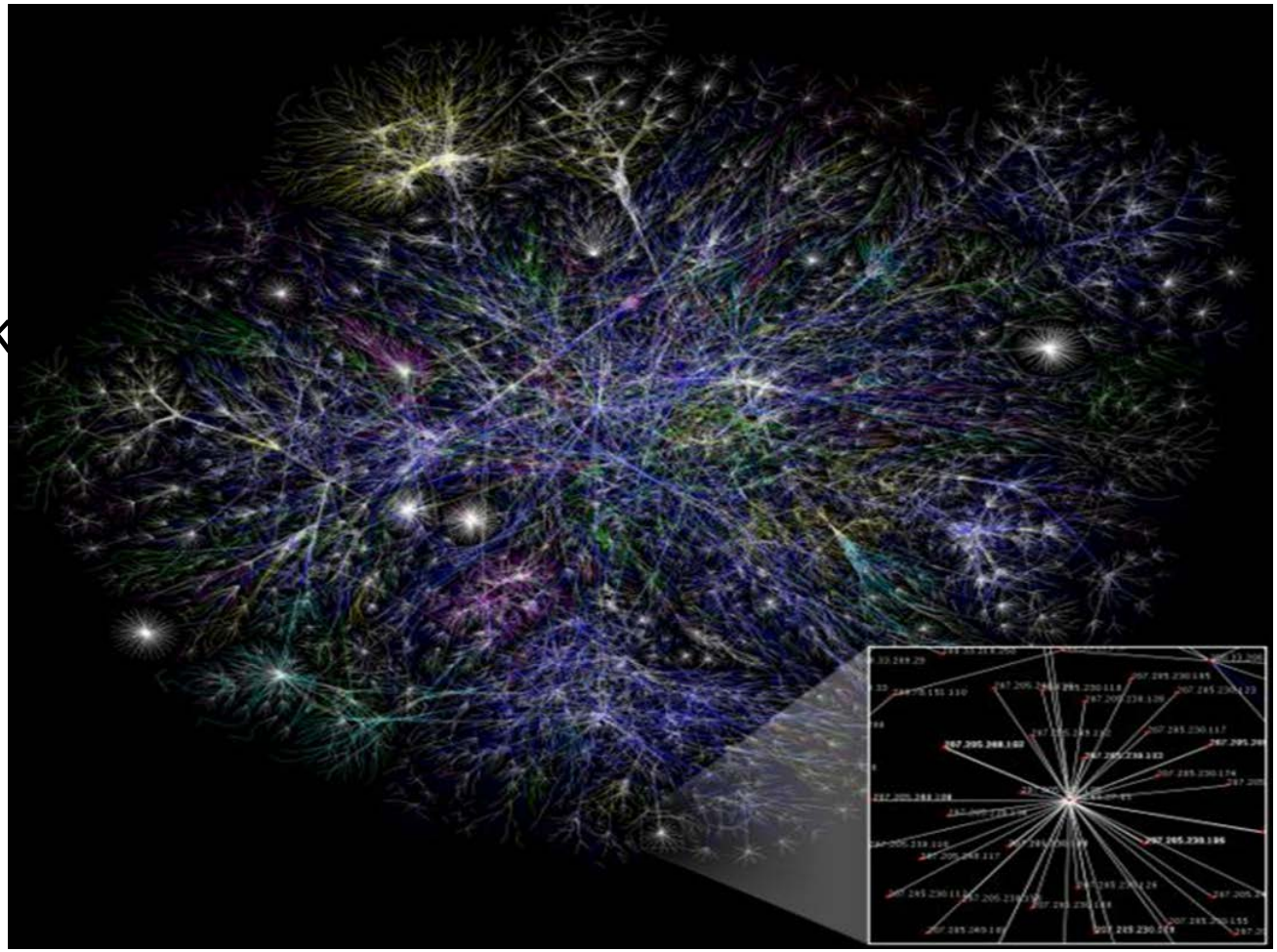
Internet Growth Trends





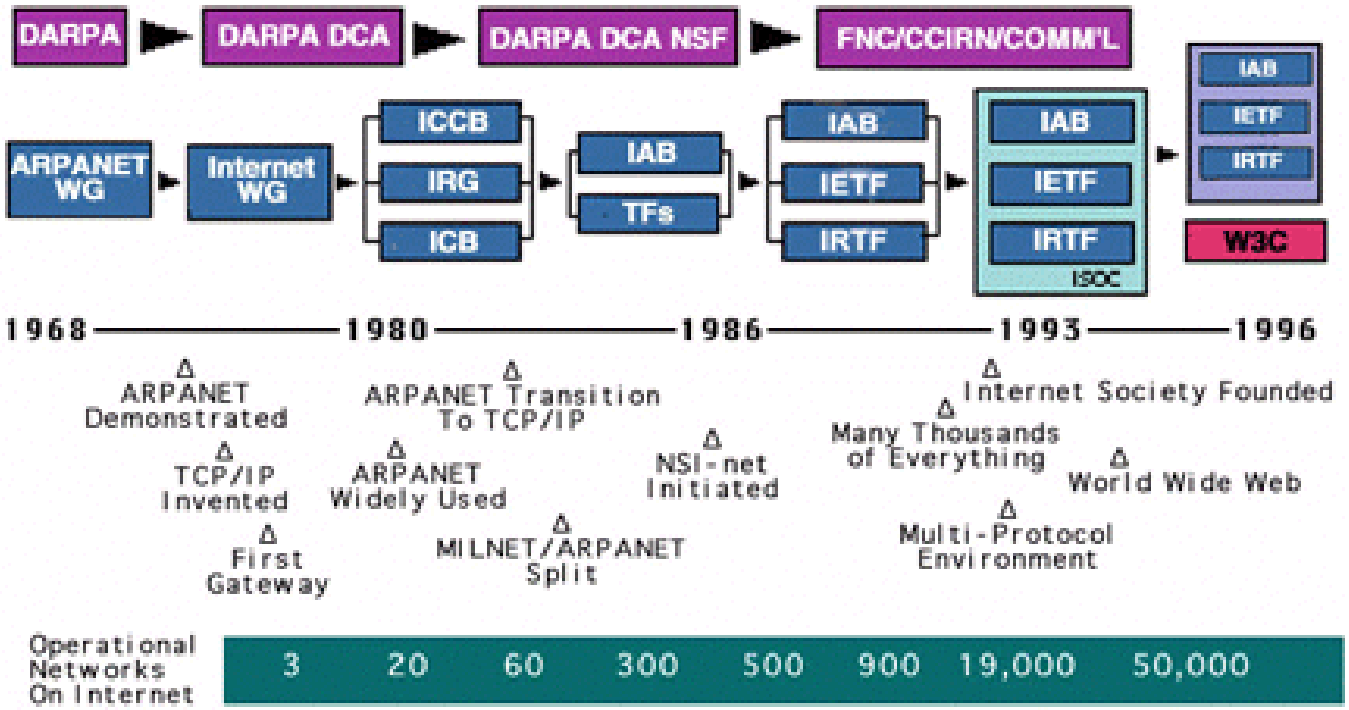
Internet Map

- **Father**
  - Cerf
  - Kahn
  - Kleinrock
  - Metcalfe
  - Gore
- **Mother**
  - Sally Floyd ?



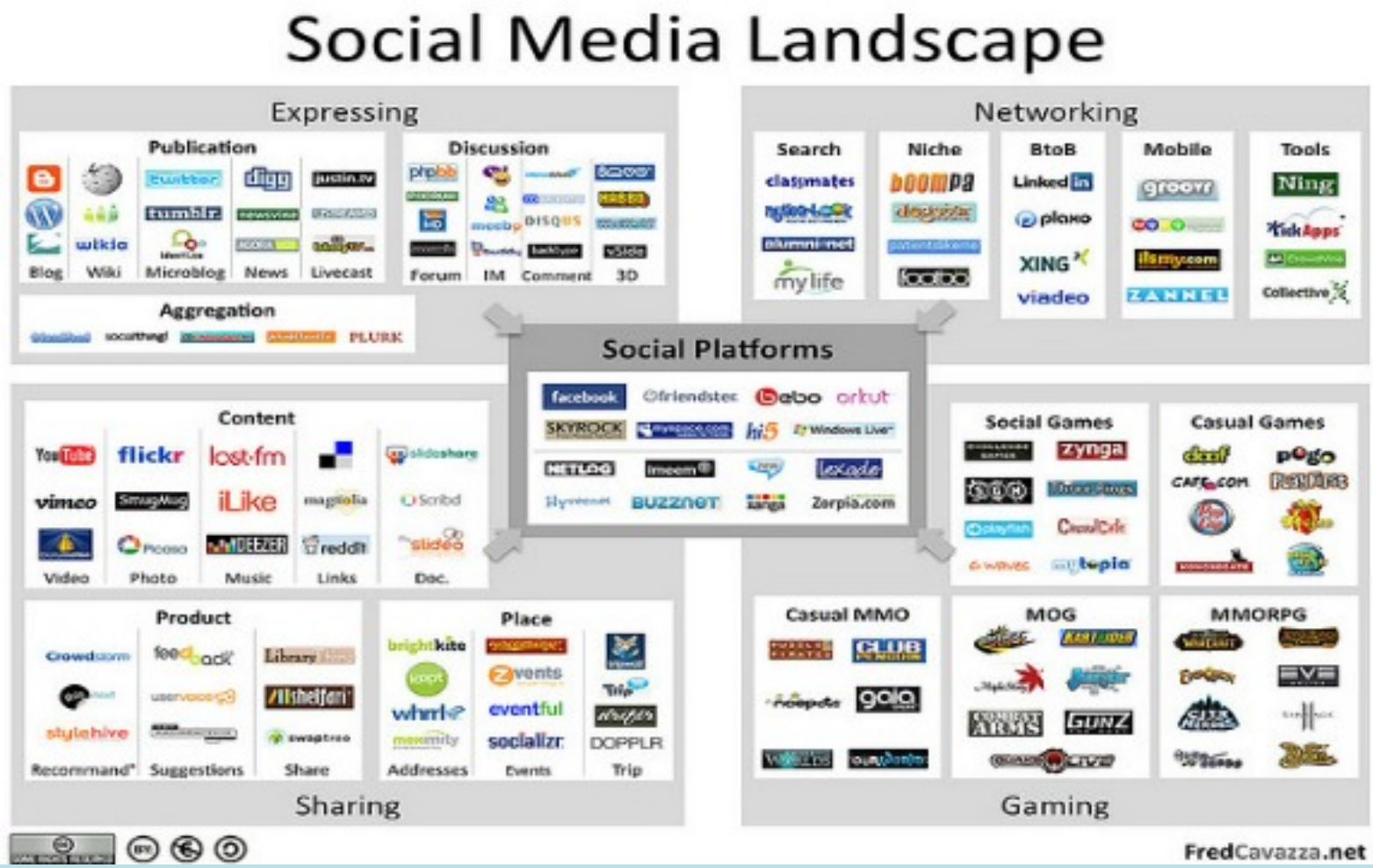
http://en.wikipedia.org/wiki/Image:Internet_map_1024.jpg

Brief History of the Internet

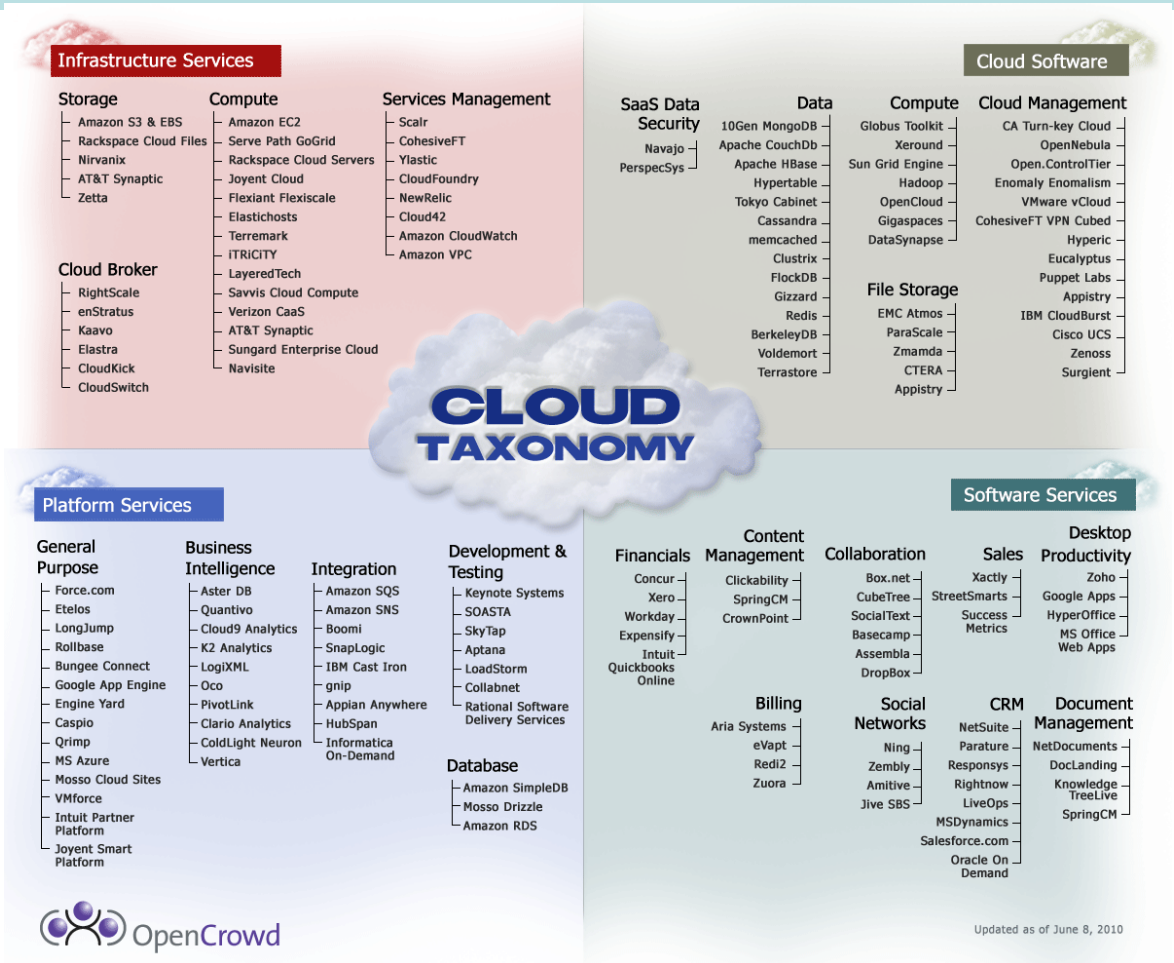


http://www.internetsociety.org/sites/default/files/Brief_History_of_the_Internet.pdf

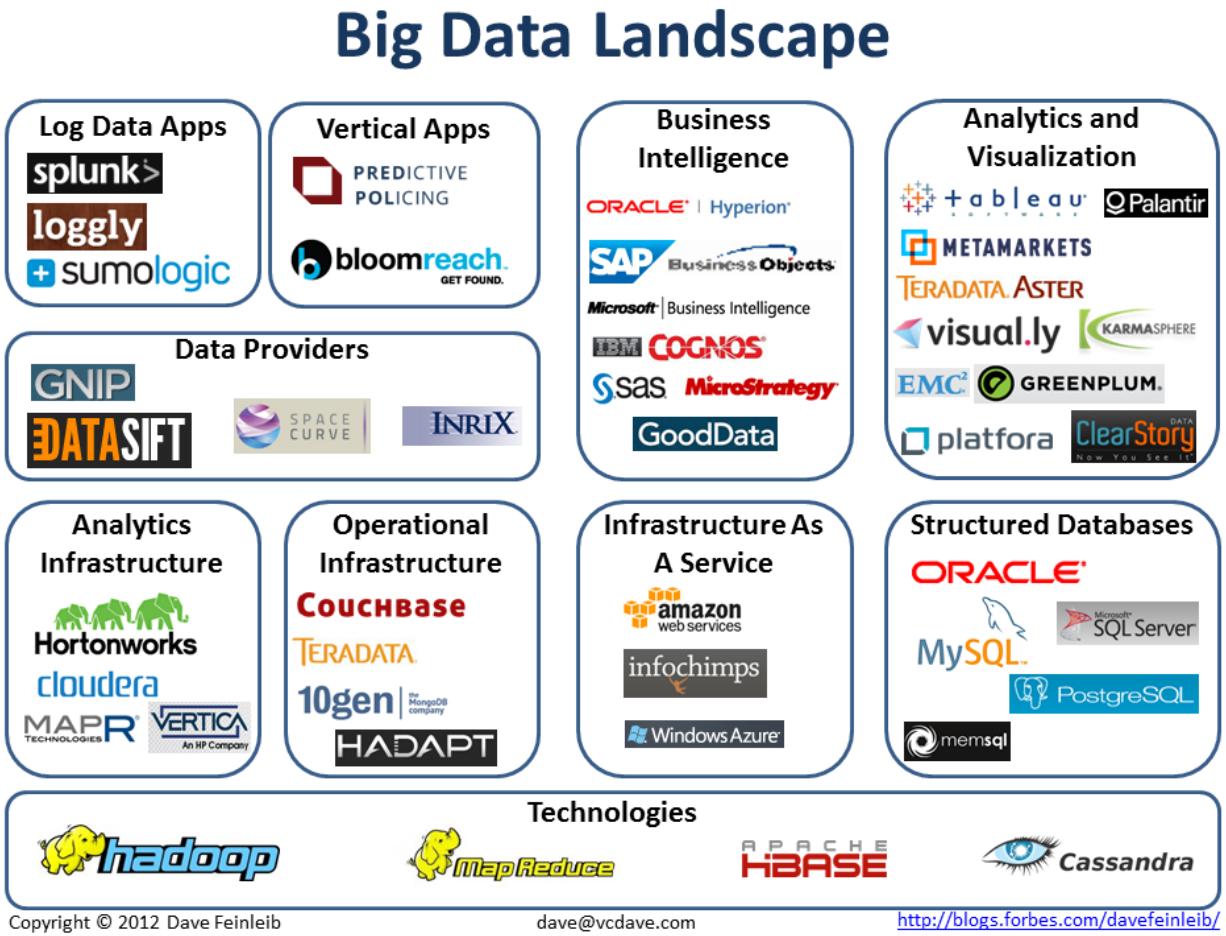
Internet Trends: Social Media



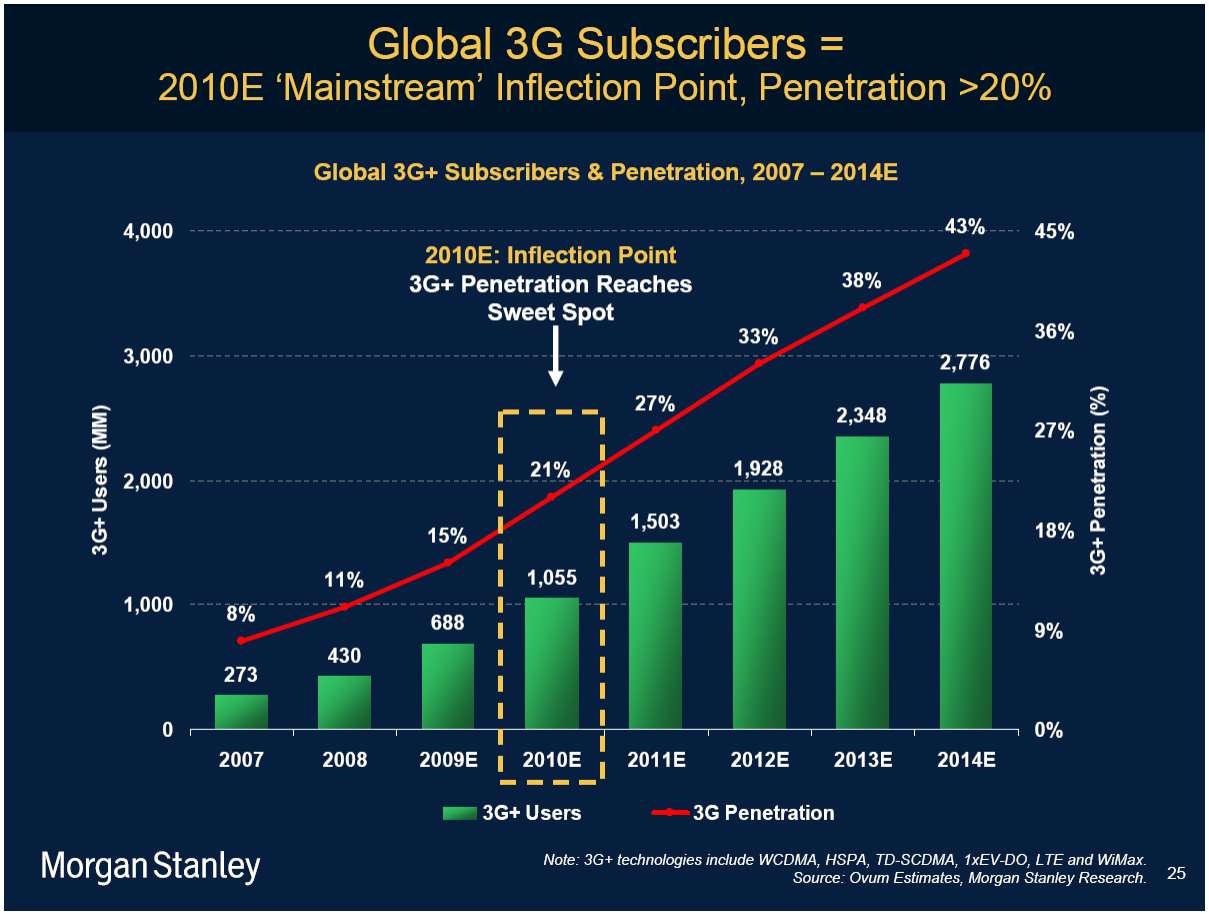
Internet Trends: Cloud Computing



Internet Trends: Big Data



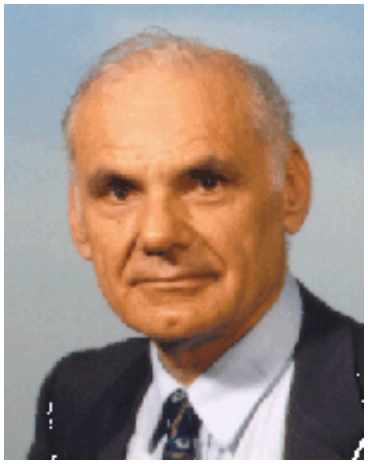
Internet Trends: Mobile Internet

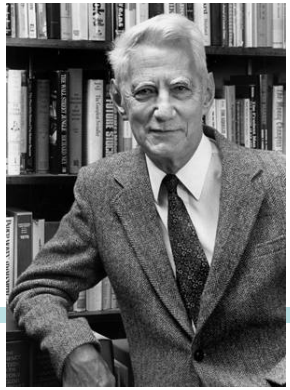


Hot Spot: Silicon Valley

Lessons Learned

- The Internet (and World Wide Web) we have today was created by some very bright, talented people who either had vision, or were inspired by other talented people's visions.
- Though their ideas were not always popular, they pressed ahead.
- Their perseverance and hard work brought us to where we are today.
- There is a lot to be learned by studying these people, their early work and keeping in mind what they had to work with.
- We, engineers, should aim to solve practical problems. Luckily, we might become rich.





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