

How The Web Grew

- or -

A Brief History of Computing

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Early “Computing” - The Abacus

- circa ~2400 BC (!!)
- used for
 - counting
 - addition
 - subtraction
 - multiplication
- still used by Chinese merchants today!!!



Early “Computing” - Astronomy

- circa ~100 BC to ~1600 AD
- used mostly to:
 - aid ocean navigation
 - help track constellations
- “analog computation”
- no real internal representation of numbers



Pascal's Mechanical Calculator

- circa ~1650 AD
- built by Blaise Pascal
 - designed as a teenager!
- *directly* add and subtract
- *algorithmically* multiply and divide
- the modern computing language Pascal is named after Blaise Pascal!



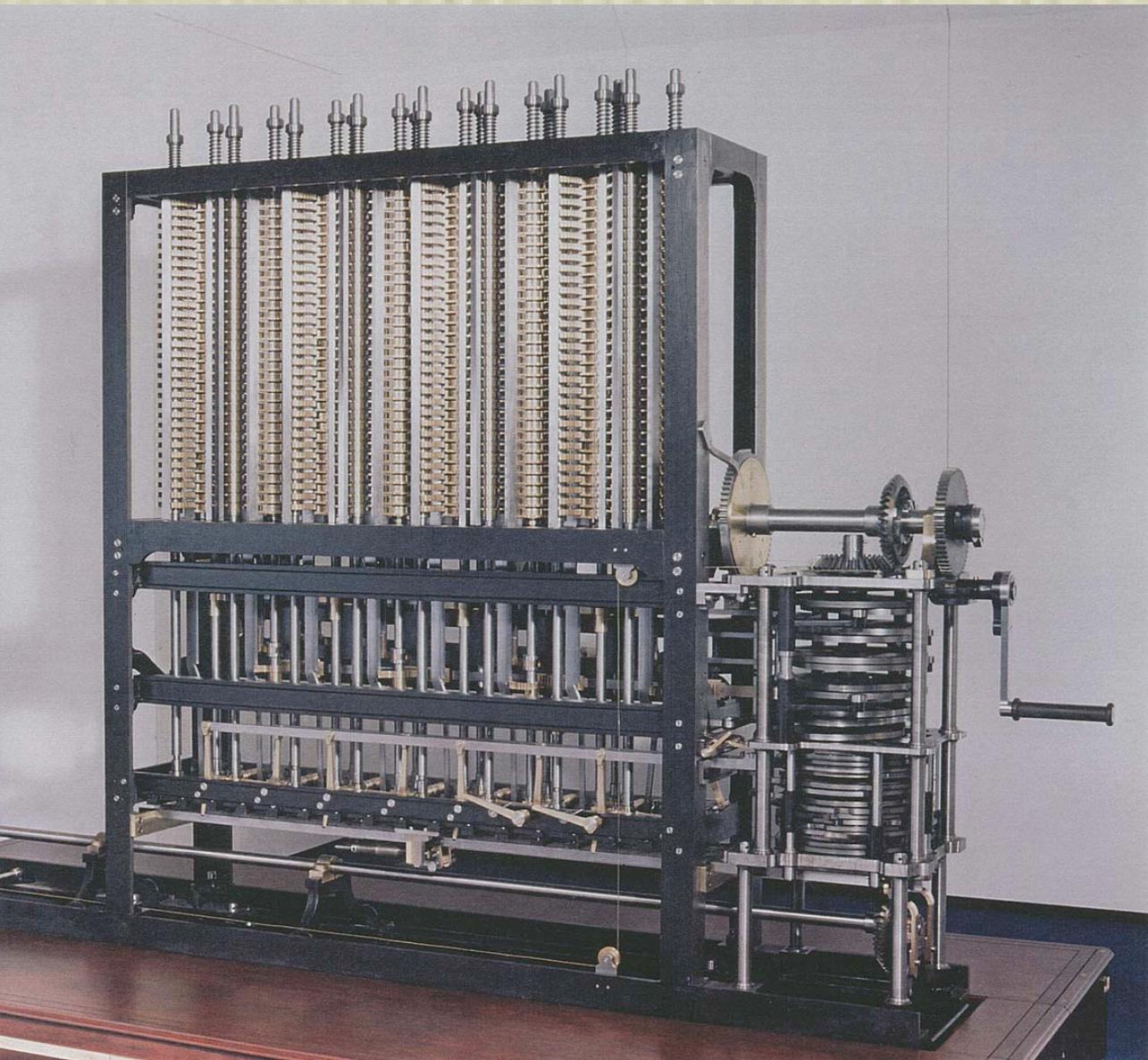
Punched Cards

- circa 1800's
- found in "automated" musical instruments
 - the punched "card" was effectively a program
- By the end of the 1800's was being used for other purposes:
 - Herman Hollerith used for the 1890 US Census!

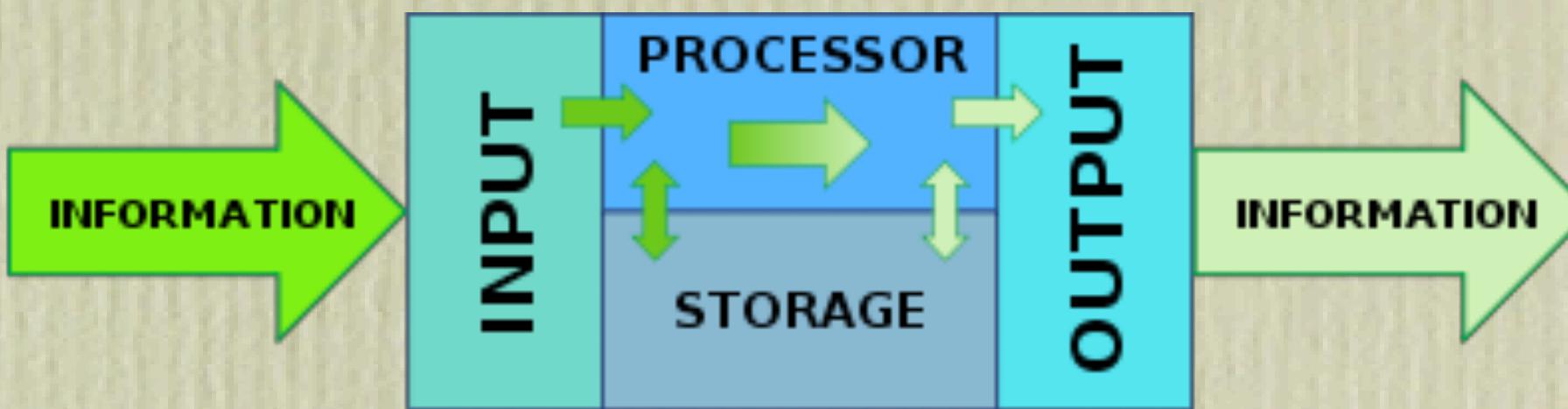


Babbage's Analytical Engine

- Designed by Charles Babbage ~1833
- First true “programmable” computer
 - used punch cards to read programs
- Not built until 1991 (!!)
 - required exact gear measurements that were not reasonable in 1800's
 - a punched “card” was designed for input programs



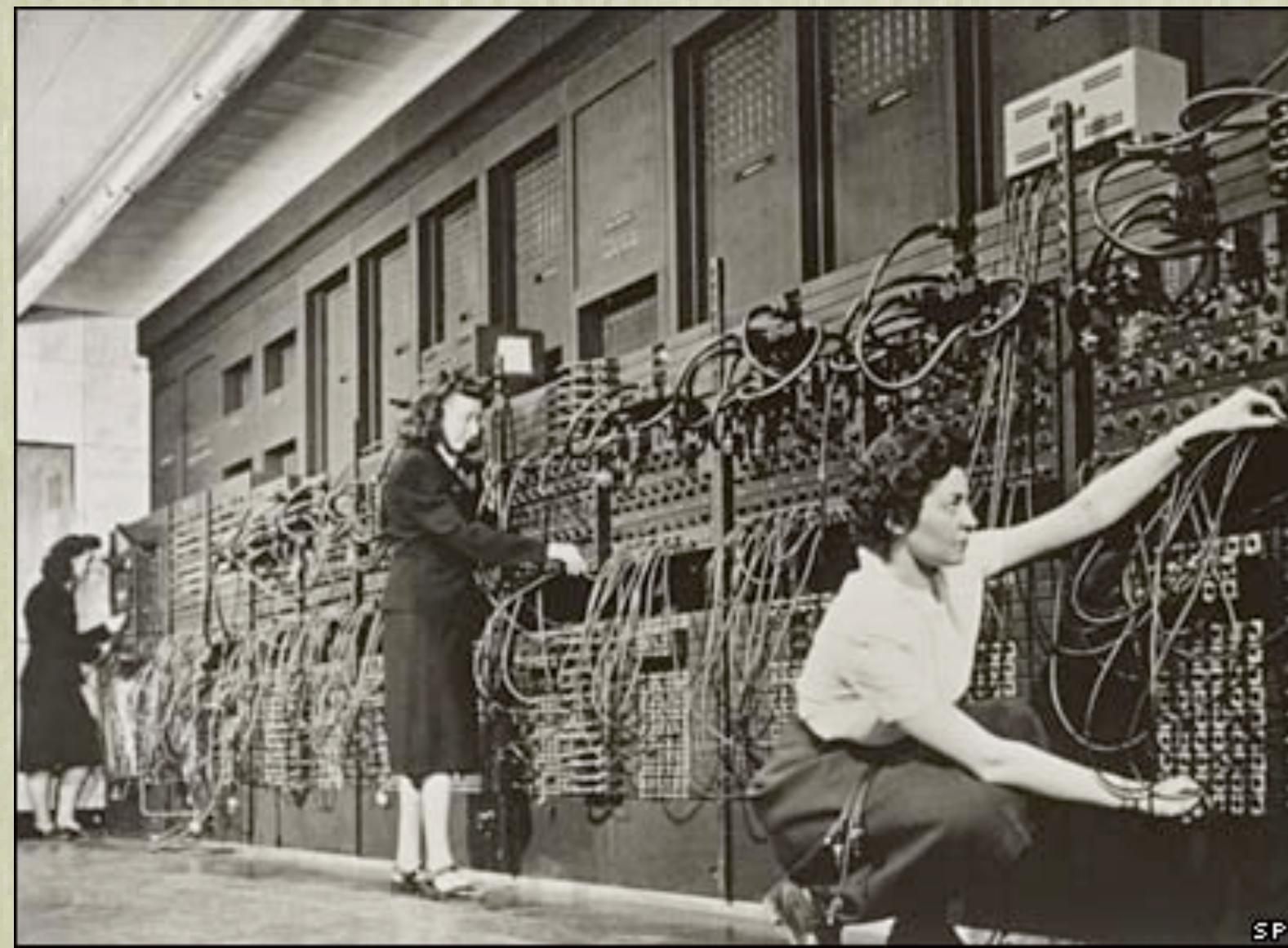
The Generic Computer



- Babbage's design led to the above “generic” computer layout:
 - Information goes in (the program and user *input*)
 - Information comes out (the running program's *output*)
 - Getting from input to output means:
 - sending instructions through a *processor* (CPU)
 - utilizing data values in computer *storage* (Memory)
 - This design is still the one found in (almost) all modern computers!

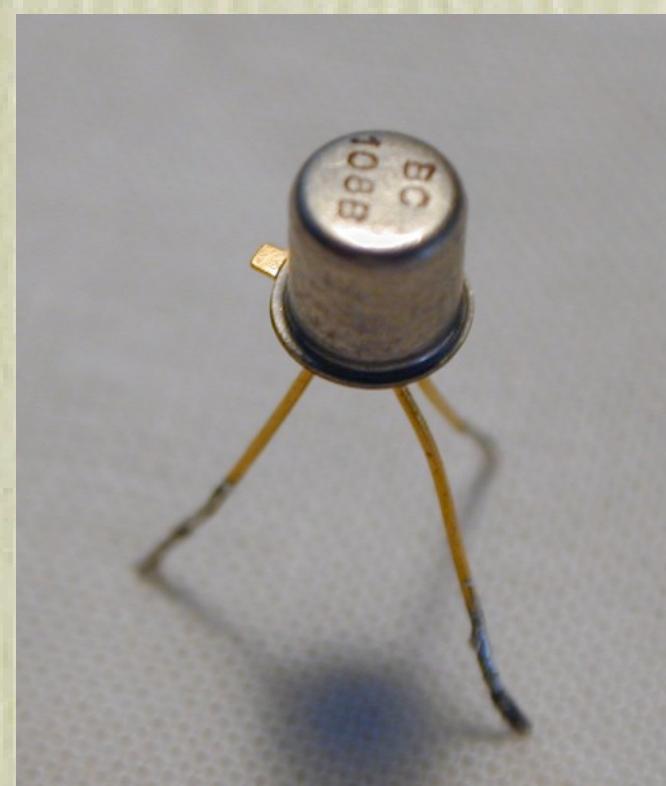
The Digital Age

- Babbage's designs still did not use electricity!!
- In 1937, Claude Shannon showed that electronic circuits could compute.
- In the early 1940's, the U.S. government recognized a need to calculate the trajectory of high speed projectiles **very** quickly. (Why?)
- In 1945 (a little too late) Eckert and Mauchly completed building the Electronic Numerical Integrator and Computer (ENIAC) for this purpose.



The Transistor Revolution

- The size/cost of ENIAC (and its successors) meant computers had limited use
 - 1000's of expensive, unreliable, power hungry vacuum tubes!
- during the 1950's *transistors* replaced the vacuum tubes.
 - cheaper, more reliable, less space
- By the 1960's, computers came down in cost
 - rentable for \$17,000 *per month* (~\$140,000 inflation adjusted)
 - an (old) iPhone is *vastly* more powerful than these computers!



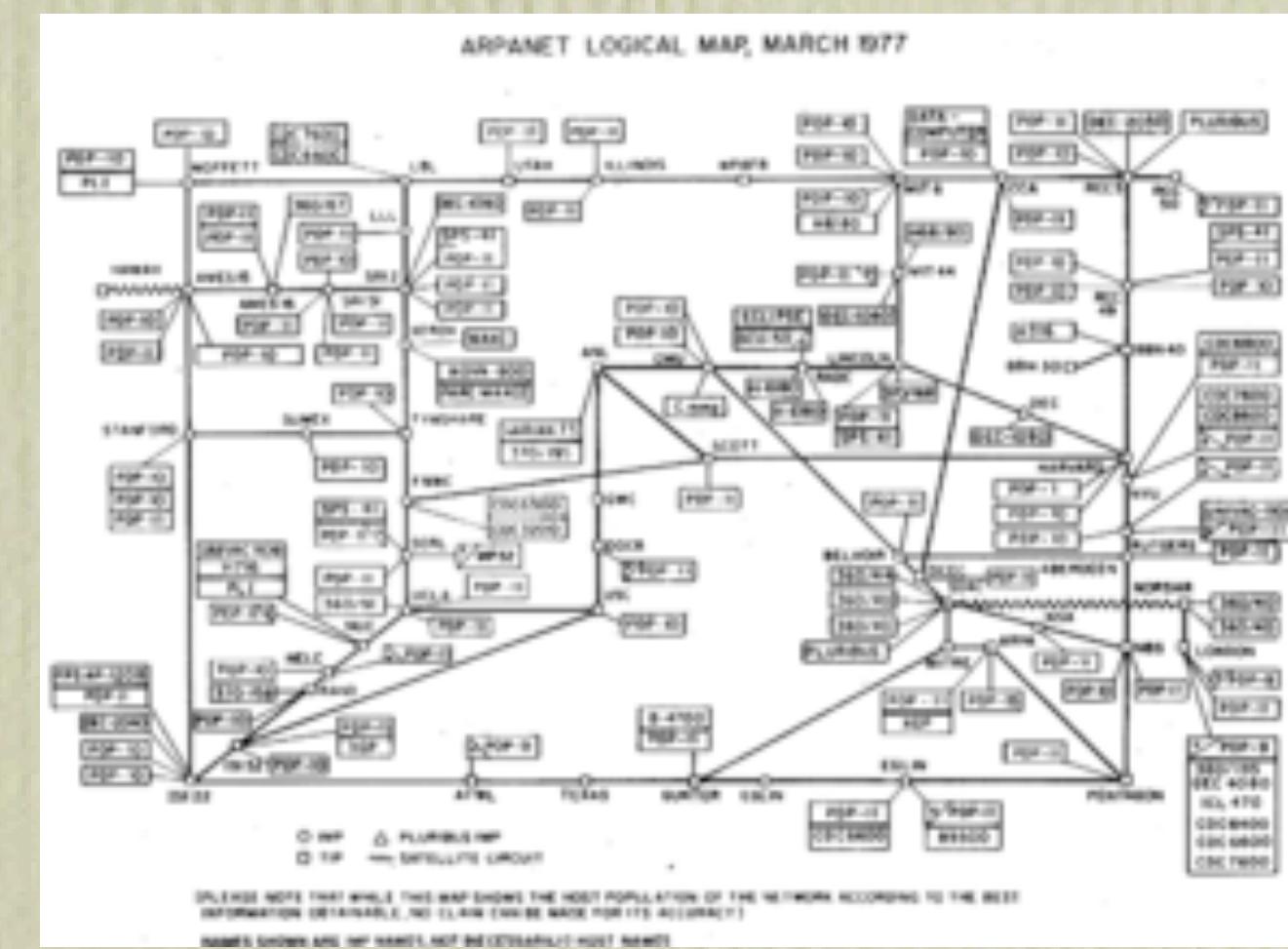
The Integrated Circuit

- By the 1970's, most computers were using *integrated circuits*
 - the major electronic components were all embedded on a single “chip” of silicon.
 - much smaller, much faster, and even more reliable.
- By the 1980's, a “home” computer cost ~\$2,000 (~\$5,500 inflation adjusted).
 - IBM PC's, Apple]['s, ... and many others
 - ...
 - an (old) iPhone is still far more powerful than these computers!



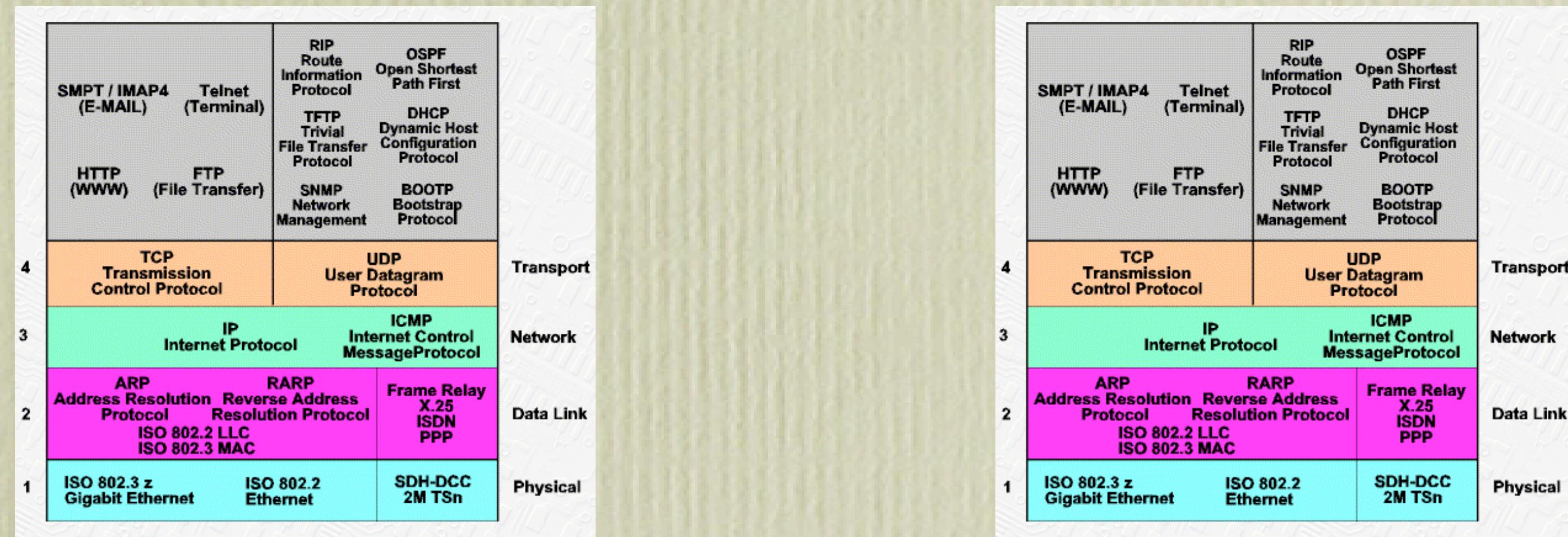
Basic Networking

- But, how did we get to the Internet?
 - 1960's: the *Advanced Research Projects Agency Network (ARPANet)*
 - essentially U.S. defense department funded research (*Why?*)
 - Forerunner of the modern Internet
 - could only send small messages and “text” files.
 - limited number of access points (mostly high-caliber research schools and government/defense institutions)



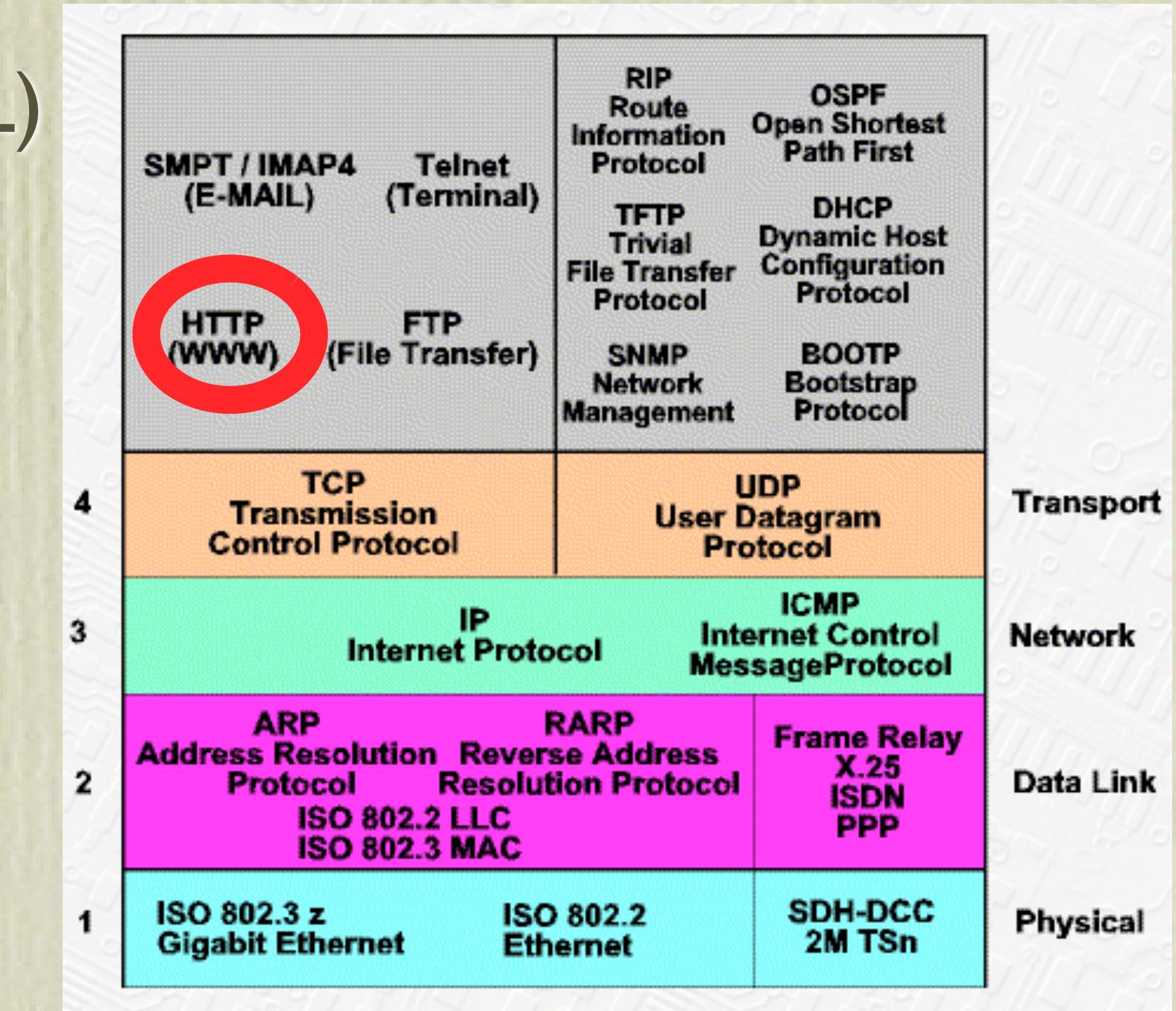
The Internet

- So, what about the Internet?
 - the same basic ARPANET communication protocols are used
 - the internal protocol layers are way beyond the scope of this class!
 - thankfully, the Internet is built on all new connections
 - If the above sounds interesting, take CSC38000(Telecom & Networks)

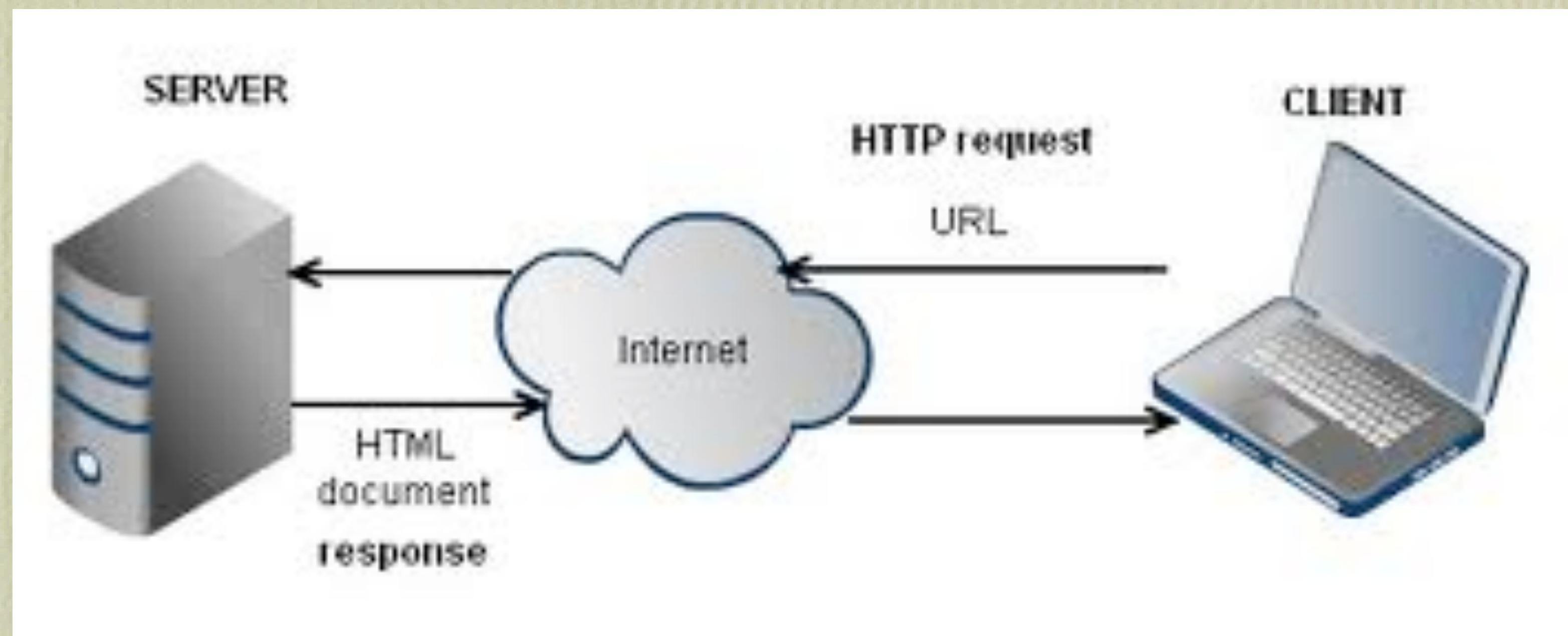


The World Wide Web

- So, what about the world wide web?
- Most web programmers have no idea how the Internet works! ...
- ... so they use Web browsers (Firefox, Google Chrome, Safari, MS IE, ...)
 - which automatically interpret:
 - HTML (code for basic web pages)
 - JavaScript (program “scripts” that manipulate HTML)
- take a look at that protocol “stack” again:
 - the WWW part is on the top!
 - web browsers “talk” via HTTP



The WWW in a Picture



- The “client” is the web browser in use, which
 - sends an HTTP request through the protocol stack
 - waits for a response to come back from the server’s protocol stack
 - the (often slow) Internet “connects” the two (again, see CSC38000)