Goals for next two weeks

● Concepts and use of HTML and CSS
  ➢ Novice, beginner, apprentice, master, ...
    • Know what you don’t know?
  ➢ Create, converse, discuss, appreciate, ...
    • Learning by doing, reading, re-doing
Goals for this week

● **Web and Internet, from A..Z**
  - Don’t know much about history

● **Foundation of deeper knowledge**
  - Differences between client and server
  - DNS and IP and .. Names and Numbers
  - How HTTP works in relation to TCP/IP
    - P is for protocol, who decides on these?
Understanding: Internet and Web

● Yesterday in the news:
  - Leap second problems?
    • http://cnnmon.ie/1xmg7F2
  - Cyber security a national imperative?
    • http://abcn.ws/1Ch8d4z

● This week in Compsci 92
  - Creating web pages
  - Understanding basics of the technical and social foundations of information and the internet
Technical and Social Foundations

What is the Internet?

- A collection of autonomous systems (AS)s
- Network of networks
- How do these networks communicate?
- Country level, company level, ...
- Until 2007, 16-bit AS numbers, now 32 bits. Explore this in more detail
Technical and Social Foundations

● What is the Internet?

- According to ... Wikipedia
- According to Jon Stewart and Ted Stevens
- According to Stephen Colbert
https://twitter.com/superwuster/status/506957742083293184

Meet Nona Farahnik, the lawyer and former TA running Tim Wu's campaign
nydn.us/1CnwlyD
What is Net Neutrality?

● http://on.cc.com/1DEJrPt
Communication on the Internet

- **What is an Autonomous System?**
  - On the surface? Deeper down?

- **Duke has ASN 13371**
  - what is an ASN for YouTube?
  - Protocols: BGP, IP, STMP, these don't matter today, but next week ...
Internet Protocol RFC 791, 1981

http://www.ietf.org/rfc/rfc791.txt

The internet protocol is specifically limited in scope to provide the functions necessary to deliver a package of bits (an internet datagram) from a source to a destination over an interconnected system of networks. There are no mechanisms to augment end-to-end data reliability, flow control, sequencing, or other services commonly found in host-to-host protocols. The internet protocol can capitalize on the services of its supporting networks to provide various types and qualities of service.
A distinction is made between names, addresses, and routes [4]. A name indicates what we seek. An address indicates where it is. A route indicates how to get there. The internet protocol deals primarily with addresses.
An address indicates where it is

- **IPv4 address: dotted quad**
  - `dig www.cnn.com : 157.166.224.25`
  - Why do we use name and not address?
  - Quad part: 0-255, note that $2^8=256$
  - Why is this a 32-bit address? What’s a bit?
  - Limitations of 32 bits?

- **DNS: map name to address**
- **Routers: map address to route**
Powers of two

- $2^2 = 4$, $2^3 = 8$, ... $2^{10} = 1024$, ...
  - 00, 01, 10, 11
  - 000, 001, 010, 011, 100, 101, 110, 111

- **IP address first 32 bits, what is $2^{32}$?**
  - Bit is a *binary digit*, why use binary?

- **Now IPv6 address is 128 bits, $2^{128}$?**
  - Internet of Things?
  - [http://www.wolframalpha.com/input/?i=number+of+atoms+on+earth](http://www.wolframalpha.com/input/?i=number+of+atoms+on+earth)
SanDisk 64GB Mobile Ultra MicroSDXC Class 10 Memory Card with SD Adapter - Retail Packaging
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Bits, Bytes, Atoms

● **Byte is 8-bits: 10101010**
  - Kilobyte usually 1000 bytes (1024 bytes)
  - Megabyte is \(1000^2\) bytes (\(1024^2\))
  - Gigabyte is \(1000^3\), or a billion

● **1 Mb is ...** [http://en.wikipedia.org/wiki/Megabyte](http://en.wikipedia.org/wiki/Megabyte)
  - One minute of music on an mp3
  - 500 pages of 2000 characters/page book
Interlude


- We'll discuss answers, reasons, questions
IETF: Internet Engineering Task Force

https://www.youtube.com/watch?v=Fpuzl91vOSM
Why do we need standards?

How do we agree on what they are?

standardization

● https://en.wikipedia.org/wiki/HDMI

IEEE 802.11

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Internet Addresses and Routing

There's no place like 127.0.0.1

Thinkgeek.com
Sir Tim Berners-Lee
Compsci 92: what does web do?

- **We want you to create:** this doesn't necessarily imply you're creative
  - You will learn and understand at different levels
  - We will learn about you, e.g., "my favorite things"
  - You will learn about each other: toward a successful course
Compsci 92: What does web do?

- **Levels of knowledge and computational thinking**
  - Everyone has used the web
  - Fourth graders can create pages on weebly.com
  - Google engineers are optimizing mobile web experience
  - What does web have to do with net neutrality?
What is a web page?

● Depends on your point of view
  - You, parents, grandparents?
  - Student in Compsci Compsci 92?
  - Software engineer at Amazon, Google, ...

● What is a webserver?
  - What is a browser?
What is a webserver?

- [http://wiki.nginx.org/Main](http://wiki.nginx.org/Main)

  Nginx powers several high-visibility sites, such as Netflix, Hulu, Pinterest, CloudFlare, Airbnb, WordPress.com, GitHub, SoundCloud, Zynga, Eventbrite, Zappos, Media Temple, Heroku, RightScale, Engine Yard and MaxCDN

- What does this software do?
What is a web browser?

- http://www.w3counter.com/trends

What does this software do?

Try a different browser

Browsers are free and easy to install.
Computer Science

- [https://www.youtube.com/watch?v=-Ht4qiDRZE8](https://www.youtube.com/watch?v=-Ht4qiDRZE8)

**Who is Luis von Ahn, what's his path?**

- Visiting Duke to talk to in April
Internet: Technical Foundations

- What is IPv4? Who created it? IPv6?
- Who governs the Internet?
- What is a domain name?
- What is a cookie?
- What is DNS? ICANN?
- What is IP, SMTP, BGP, HTTP?
Susan Athey

- https://www.youtube.com/watch?v=8XyRVcJz7RY

- From Data to Bitcoin
  - Duke connection