Network Protocols

By example...

Goal: browse to http://www.depaul.edu
What things happen first?

• What happens when you hit enter or click the link?
• What does the browser do?
URL interpretation

- Parses request URI
- It's an HTTP GET
- For www.depaul.edu
- What is www.depaul.edu?
Domain name system

• Hold on... maybe the browser has a name cache?
• OK, say it doesn't...
• gethostbyname() or equivalent
• The whole resolution process happens...
Whats involved in resolving?

• Are we a stub resolver? Full resolver?
• Does hosts(.txt) have www.depaul.edu in it
• OK, we're a stub, who do we talk to?
  • And how did we get that information?
• OK, let's format an A? query. What about AAAA?
  • Maybe, oh man, this is a PITA already!
OK, let's send the query!

• Not so fast!
• Put the DNS message in... UDP? Ya thats good
• OK, IP packet, sending to DNS resolver, easy
• From... my IP address? Oh, man am I connected?
• OK, send it on the wire!!
Finish your IP encap bub

- Fits in MTU, checksum, set TTL, etc... OK go, go!
- Who you talking to first? Is it a local host?
- Oh, gotta talk to a router... OK lets do that.
  - How do I know who that is? Argh...
- OK, got it, get this into Ethernet and awa...
- OH darn, gotta ARP...
Here ya go router!

• OK, Ethernet daddr is to the router?
  • Wha...? is that right
• Yep, unless your mask is broken
  • What the @?!# is a mask?
• Router's got it, what's it gonna do?
• Re-encap... routing protocols now?!?... policy decisions...? ARP some more?
• At least no DNS... I think
Skip ahead, DNS server has query!

We're not even close to done!!
DNS server processing

• Process query
  • Can we?
  • Do I know about this name? Cache or auth?
  • How do I go about finding out?
• If not auth and not cached, how many more steps?
• Quite a few probably
• ...skip ahead ...skip ahead ...skip ahead
Time warp...

- Sending TCP packet
  - UDP for DNS, now TCP? What gives?
- Gotta setup a connection
  - Connection? I thought this was connectionless
- Exchange options, sequence numbers
- Timers, congestion control, sliding window, oh my!
This ain't gonna be a cake walk

- It's hard to learn how this all works even after year's of experience, never mind a short protocols course
- But we'll try our best...
- I left out a whole bunch of stuff. This slide deck could have been hundreds of pages long, easily! ..and that's without pictures