CS444/544
Programming Project 3 - Twig
Due: Thursday, April 3 (11:59pm)

This assignment is intended to tie together all of the concepts that we've discussed so far. You're going to build a tiny networking operating system called "*twig*" (like Juniper, but much, much smaller). Your *Twig* operating system was a single network interface and can only respond to packets.

1. Respond to ICMP echo requests
2. Contain a simple ARP cache
3. Understand and demultiplex the UDP protocol
4. Implement a server on the UDP echo port (see RFC 862)
5. Implement a server on the UDP "Time Protocol" port (see RFC 868)
6. IP/UDP/TCP Checksums. To be able to talk to external programs (more on that later), it will be necessary to implement IP, ICMP, and UDP checksums
7. Hardware Addresses and ARP. For now, since we're only responding to incoming packets, your ARP cache will simply be populated by the mappings in incoming packets
8. Keep in mind that you will be expanding the program in a couple of weeks to support routing tables, packet forwarding, and more advanced processing, so be sure to keep your interfaces clean and use lots of functions that can be reused later

Your Twig program must support the following options:

-i IPv4addr_masklength

For example, if the argument `-i 192.168.1.10_24` is given, then Twig should assume that it has IP address `192.168.1.10/24` on that interface and that it should use the following file for reading and writing packets:

- `192.168.1.0_24.dmp`

Because we are not yet implementing routing, your twig machine will only have a single interface.

Note that the host-part of the IP address was removed from the file name.

-d

To print debugging information (more detailed output). In particular, this option must do the following:

1. When specified at least once, a message should be printed ever time a packet is received
2. When specified at least once, a message should be printed when an ICMP echo request is responded to
3. When specified at least once, a message should be printed when UDP echo messages are responded to

-h Print a quick summary of the command line arguments and exit. This information should also be printed if you don't understand one of the command line arguments.

Working with the packet interface files

1. The network/packet interface is still a work in progress and Silas will explain more about the mechanism on Thursday