

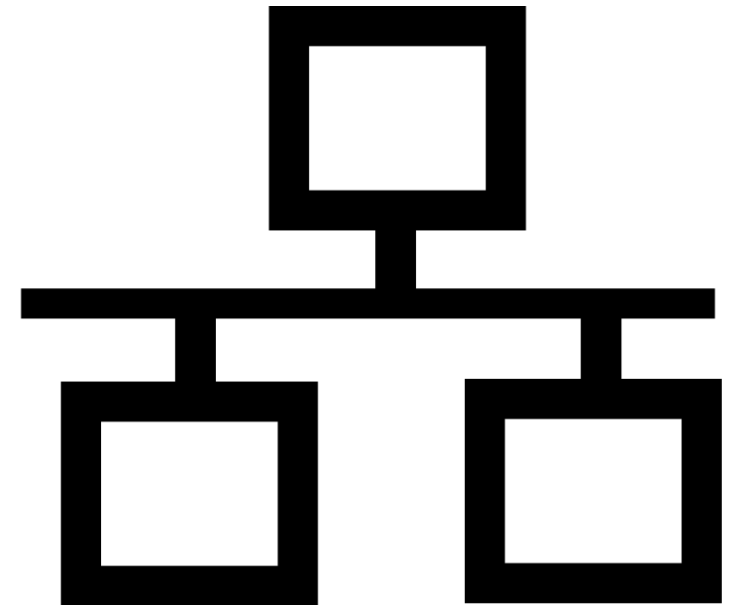
Introduction to Networking



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University of Virginia

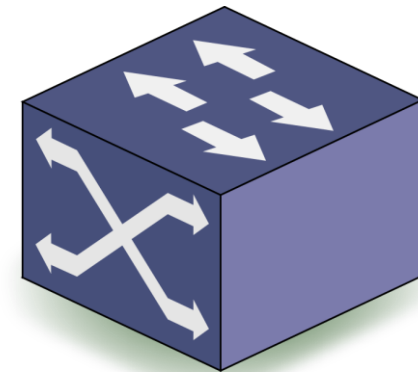
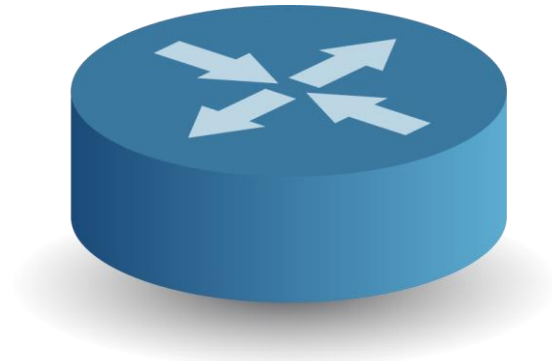
Networks?

- Two or more computers talking to each other
- Wide Area Network (WAN):
 - Large geographical area
 - Multiple networks attached together
 - Internet is the biggest WAN
- Local Area Network:
 - Smaller (home, office)
 - Doesn't have to be attached to internet



Hardware

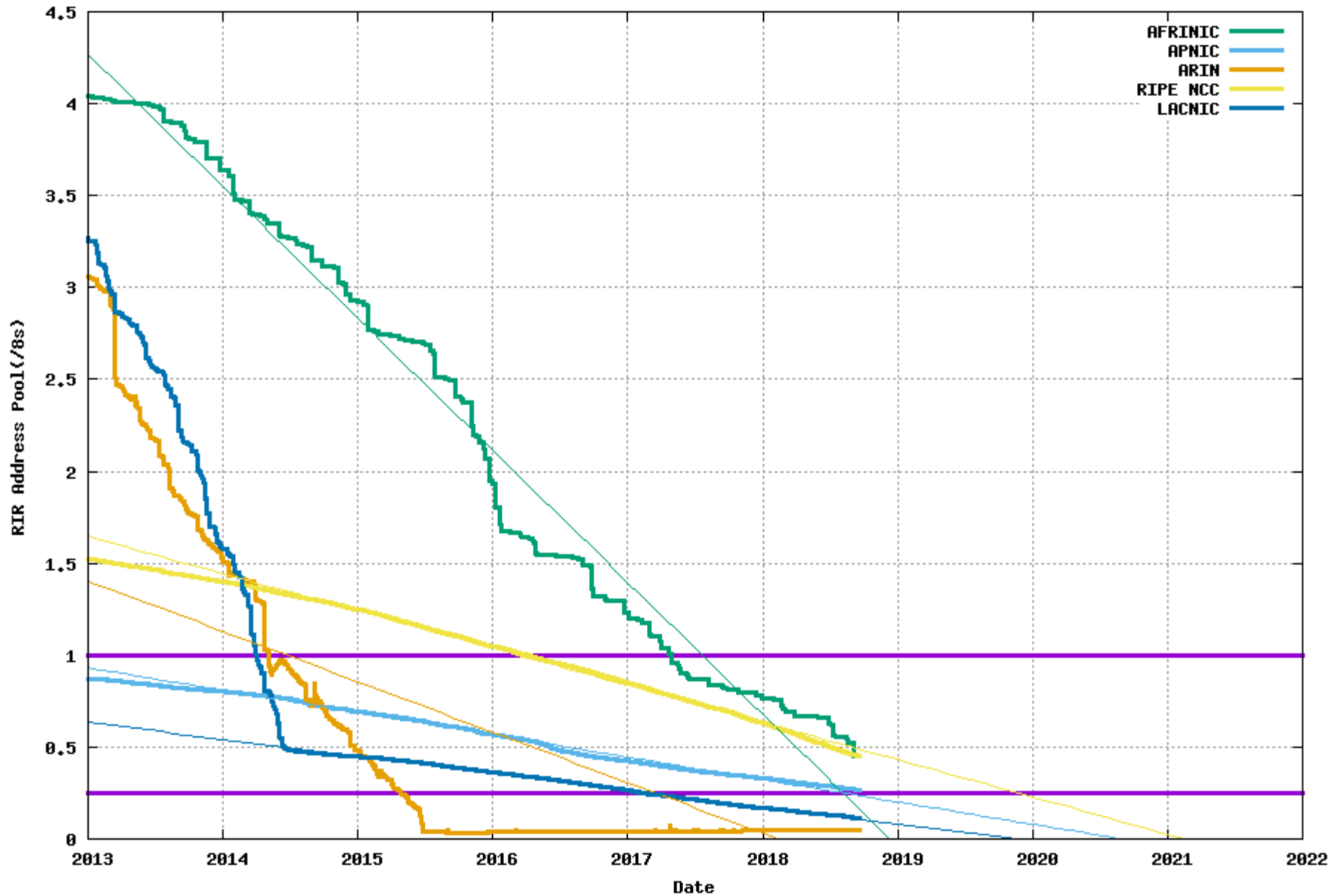
- Transmission: ethernet, radio (wifi), optical cables
- Computers – anything w/ cpu
- Routers – connect networks together
- Switch – connects computers on the network
- Modem – analog-to-digital and vice versa

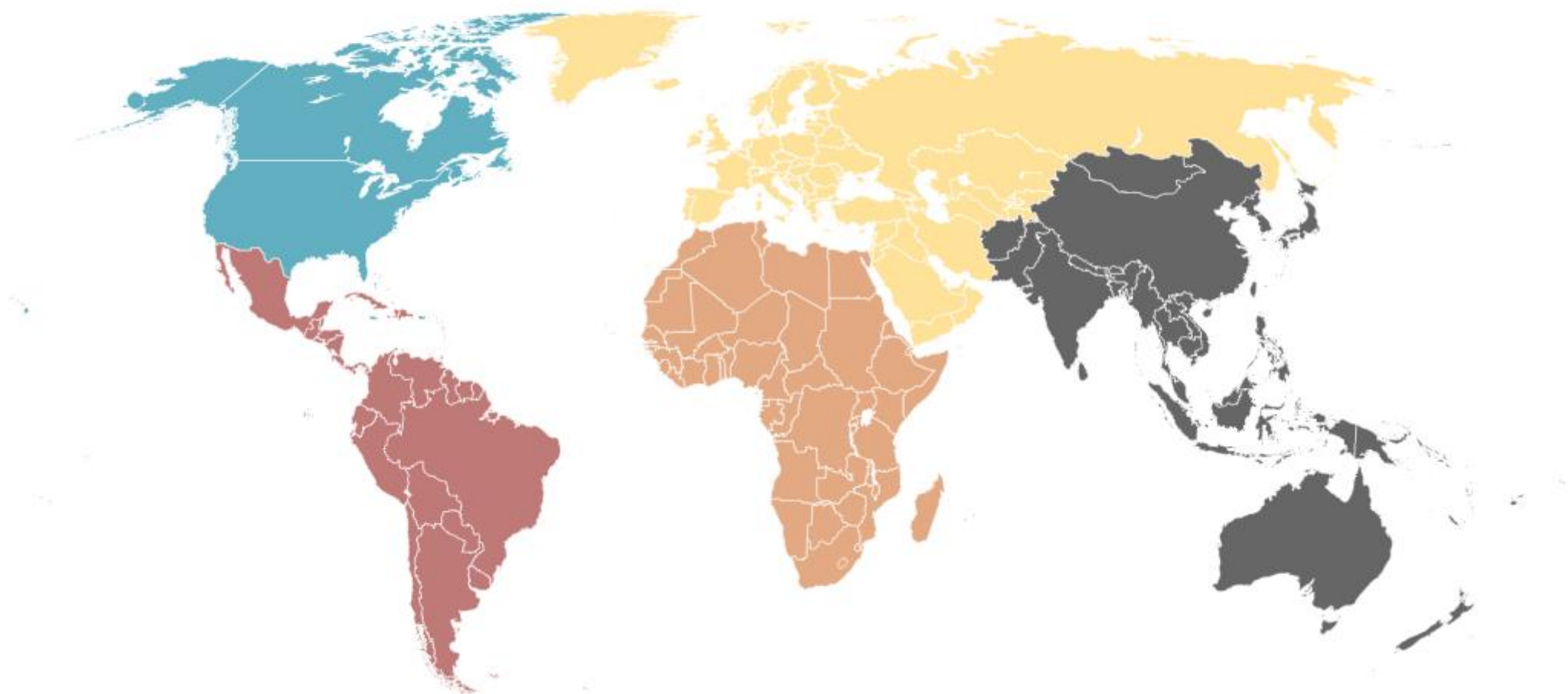


Addressing

- IP (Internet Protocol) address identifies the computer on the network
 - IPv4 - current standard, ARIN already ran out
 - MAC – an address burned into the NIC
- NAT helps to connect networks
 - a computer has a public & private IP

RIR IPv4 Address Run-Down Model





Packets & Protocols

Packets

- Units of data
- Generally small
- Helps to standardize communication
- Contain sender and receiver address



Protocols

- Rules that govern interaction between machines
- Describe the handshake and transmission processes
- A port is a specific communication channel
 - Ranges from 0 to $2^{16}-1$
 - UDP and TCP do not conflict

Protocols

- TCP
 - Reliable
 - SYN -> SYN/ACK -> ACK handshake
 - Re-sends corrupted or missing data
- UDP
 - Doesn't resend
 - Faster



Kirk Bater

@KirkBater

Follow



This image is a TCP/IP Joke. This tweet is a UDP joke. I don't care if you get it.

Thread



iamkirkbater and jkjustjoshing



iamkirkbater  Aug 23rd, 2017 at 9:37 AM
in #www

Do you want to hear a joke about TCP/IP?



7

7 replies



jkjustjoshing 5 months ago
Yes, I'd like to hear a joke about TCP/IP




iamkirkbater  5 months ago
Are you ready to hear the joke about TCP/IP?



jkjustjoshing 5 months ago
I am ready to hear the joke about TCP/IP



iamkirkbater  5 months ago
Here is a joke about TCP/IP.



iamkirkbater  5 months ago
Did you receive the joke about TCP/IP?



jkjustjoshing 5 months ago
I have received the joke about TCP/IP.

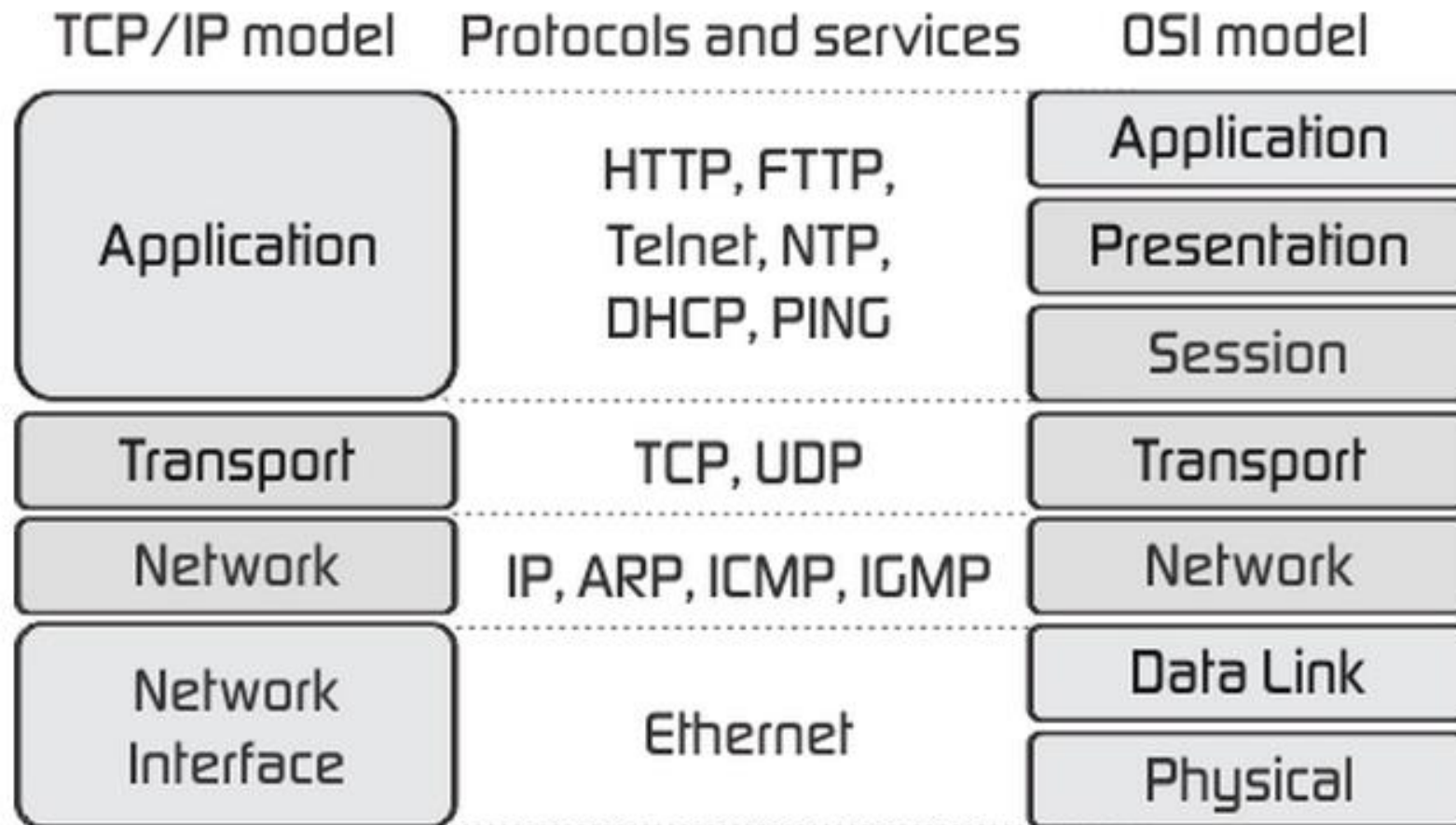


iamkirkbater  5 months ago
Excellent. You have received the joke about TCP/IP. Goodbye.

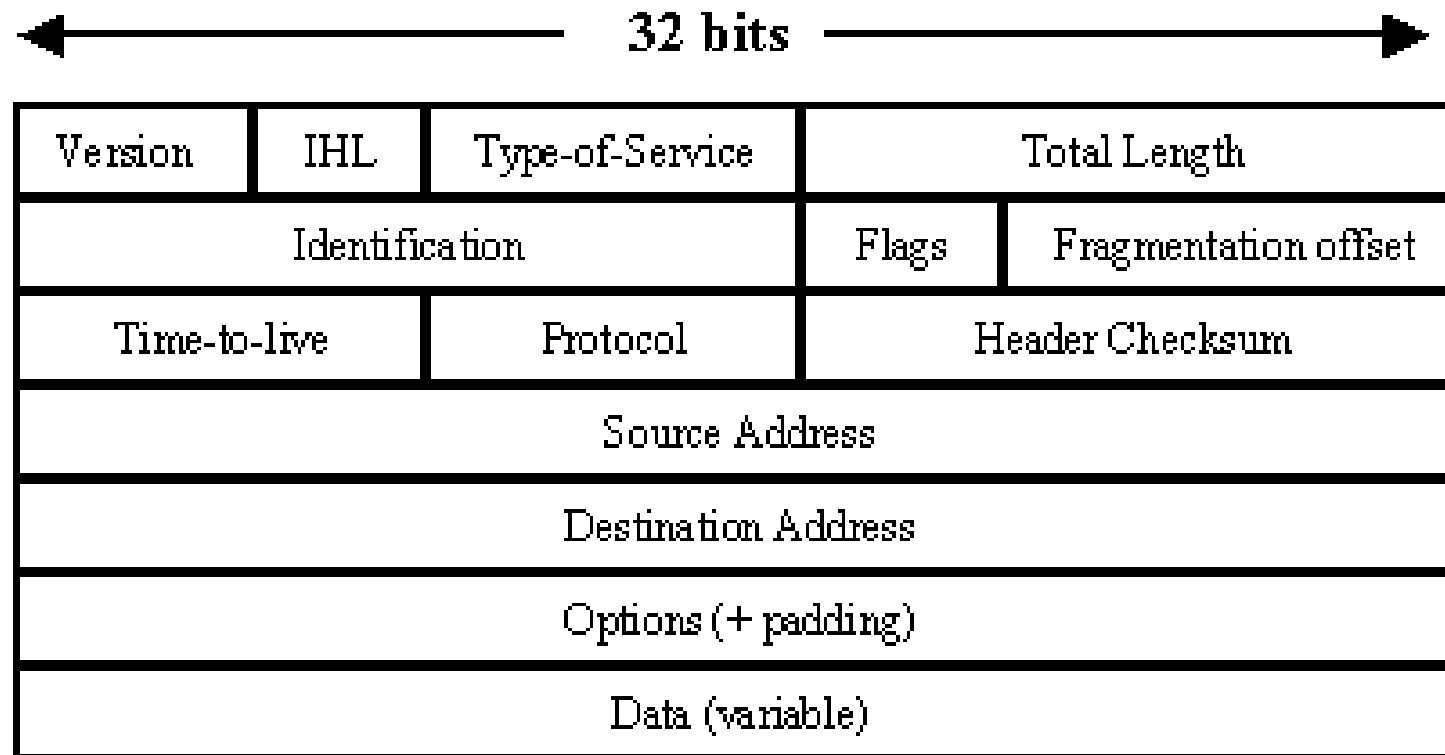
Other Protocols

- ARP
- HTTP
- HTTPS
- FTP
- SSH
- SMTP
- POP₃
- IMAP
- ICMP
- DNS
- DHCP

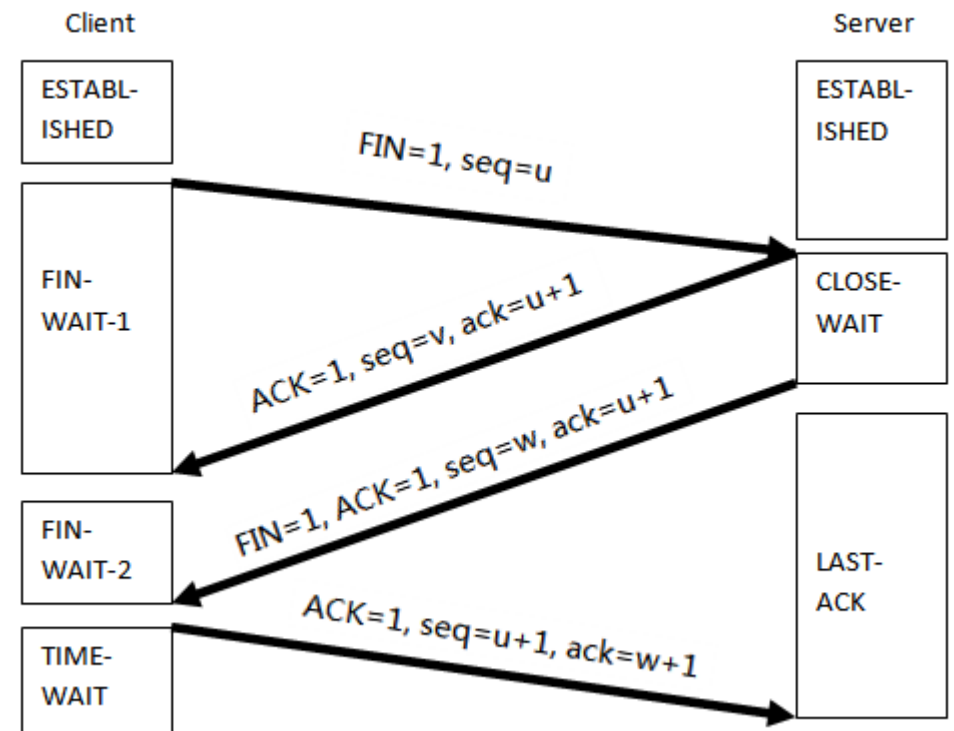
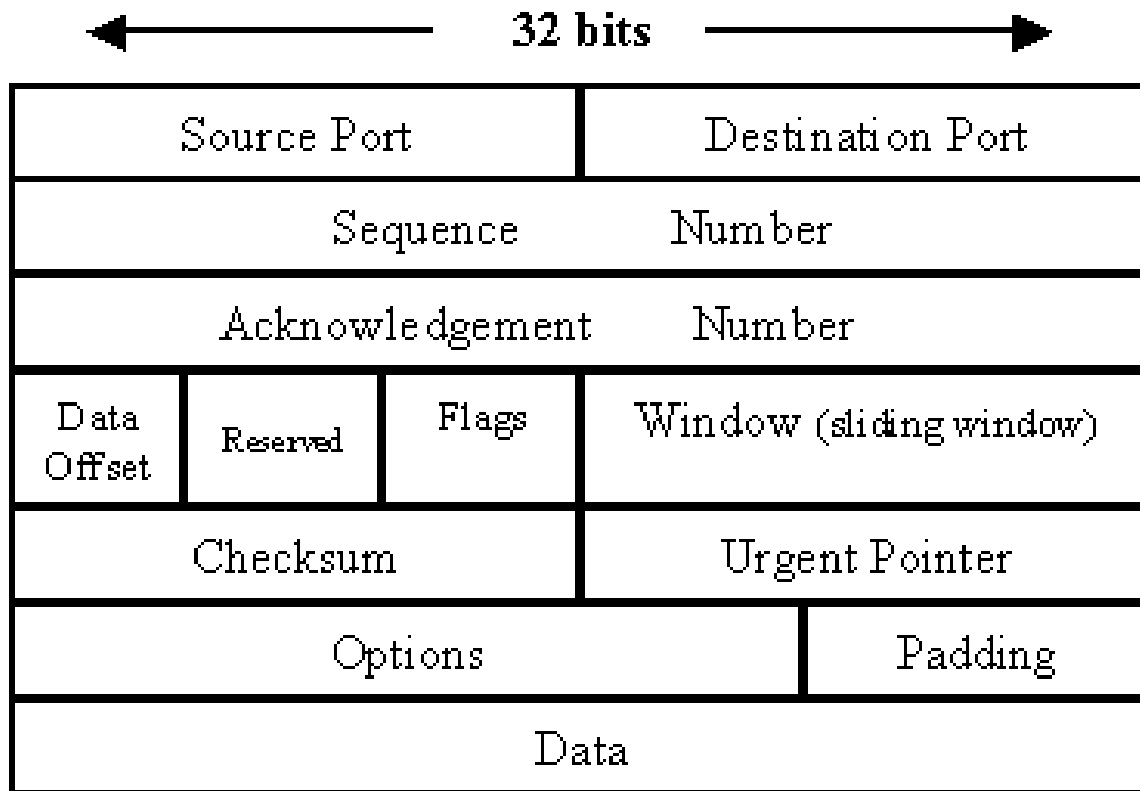
Networking Models



IP Packets




TCP Packets



UDP Packets



The logo features a thick black horizontal line. In the center of this line, there is a stylized shark fin shape, also drawn with a thick black outline. The fin is curved upwards and backwards, resembling a dorsal fin.

WIRESHARK

Installation

- <https://www.wireshark.org/>
- If on Windows, need to install WinPcap
 - Part of the same installer
- Issues? Google.
- Download some practice files:
<https://tinyurl.com/yczp2gld>



Demo

Other tools & commands

- nmap
- ifconfig / ipconfig
- whois
- nslookup
- netminer
- tcpdump

Networking attacks

- ARP Spoofing – fake ARP packets (computers associate wrong MAC to a valid IP address)
- DNS cache poisoning
- Man in the middle (MITM)
- DoS and DDoS

?