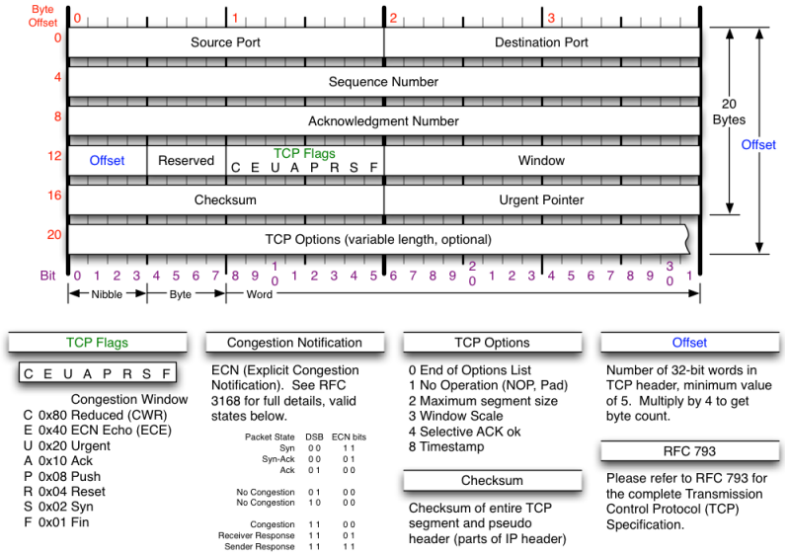
CS241 #36 Protocols

1> Protocol at the TCP level - Handshaking

TCP Packets: What is "SYN. SYN-ACK. ACK" ?

What is the sequence number and what is it used for? What is its initial value & why?

(I see the port number but where is the machine's IP address?)



2> Examples of Denial of Service

SYN flood

Distributed DOS

"Internet of Things DOS"

3> Which TCP client or server call will result in the first "SYN" packet?

4> TCP Handshaking and the speed of light

The moon is 1.3 light seconds distant. The TCP client is on the Earth and a lunar console runs a TCP server. Assume a new TCP connection is required each time.

3.1 Save the astronaut. How many seconds elapse between wanting to send a CLOSEAIRLOCK message and the server receiving the data?

```
fd=socket(...)
connect(fd,...,...)
write(fd,"CLOSEAIRLOCK!",13);
```

3.2 How many seconds elapse between requesting data from the server and receiving the result?

```
fd=socket(...)
connect(fd,...,...)
write(fd,"READTEMP!",9);
bytes=read(fd,buffer,256);
```

5> TCP and web performance

HTTP/1.0
If the client-server round trip time is 10 ms. What is the minimum time required to display a page with an image? Assume HTTP/1.0 (and that the image requires a separate request).

6> Better... Faster...

Performance improvements in HTTP/1.1

Improvements in HTTP/2.0

Why did Google create QUIC ?

7> Remote Procedure Calls

```
void updateScoreBoard(char*name, int score) {
 char* mesg; // todo: error checking!
 asprintf(&mesg, "newscore,%s,%d",name,score);

 write( fd, mesg, strlen(mesg+1));
 free(mesg);
 // Why did I also send the null byte?
}
// You could also send the message size
// My protocol! So I'll choose bigendian binary format
uint16_t mesglen = htons( strlen(mesg) );
write( fd, & mesglen, sizeof(mesglen) );
write( fd, mesg , strlen(mesg) );
```

8> Subverting protocols

Case study: Heartbleed April 2014

```
 /* simplified */
sock_fd = accept(server_fd);
while(1) {
  secureread(sock_fd, &request, &reqsize);

  switch(request->request_type) {
    case HEARTBEAT:
        // echo the client message back
        securewrite(sock_fd,
                    request->content,
                    request->content_length
        );
        break;
    case (...):
        ...
    break;
  }
  free(mesg);
}
```