Over the Internet

Are you coming to bed?

I can't. This is important.

What?

Someone is wrong on the internet.
Highlights

- Sockets and packets and ports, oh my!
Packet

When data travels through the Internet, it passes through many “stations” along the way.

To understand where each station will pass it on to, you need an agreed upon layout/format.

This is very similar to the normal/snail mail.
Packet
Packet

Where to
(standard format with zip code)
Packet

Once you get there who is it for?

Where to
(standard format with zip code)
Packet

Message goes inside

Once you get there

who is it for?

Where to

(standard format with zip code)
Packet

(Payload)

Message goes inside

Once you get there
who is it for?

Port

Where to
(standard format with zip code)

IP address (34.22.123.45)
Packet

The “IP address” is where on the Internet you want to send the information (what computer)

The “Port” is which app/program on the computer the data is for

Typically both the port and IP address are represented by numbers (or a set of numbers) (No real representation other than the rules we impose, like where “zip codes” are)
Packet

All these things together:
- Message (Payload)
- IP address (where)
- Port (who)

... is what we call a packet

Packets have a fixed size, so larger messages are broken up over multiple packets
Sockets

In order to send in C++ over the Internet, you also need a variable for the “connection”

This is very similar to ifstream and ofstream where the variable represents the “file”

These variables that represent the connection are called sockets and you have to set them up much like how you .open() files in C++
Sockets

Since we are sending things over the Internet, we actually need to make two programs:
- **Server** = one who receives (sorta)
- **Client** = one who sends (sorta)

Technically, they both transfer information, but the servers need to be setup first and **listen** for the clients to send them a message
# Sockets

<table>
<thead>
<tr>
<th>Server</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP address:</td>
<td>IP address:</td>
</tr>
<tr>
<td>216.239.34.21</td>
<td>123.45.67.89</td>
</tr>
<tr>
<td>Port: 443</td>
<td></td>
</tr>
</tbody>
</table>
Sockets

IP address: 216.239.34.21
Server

IP address: 123.45.67.89
Client

Port: 443
Sockets

Server

IP address: 216.239.34.21
Port: 443

Send: 443

Client

IP address: 123.45.67.89
Sockets

IP address: 216.239.34.21
Server

IP address: 123.45.67.89
Client

Port: 443

Send: 443
Sockets

There are quite a bit of technical details to setting up the variables in C++...

To make the server run, you need to:
- make a “socket” number
- “bind” the socket number to an actual spot
- start “listening” for people to connect (i.e. program is ready to take requests)
- “accept” an incoming request
- send data back and forth (“read”&”write”)
Sockets

Clients are slightly easier as they don’t need to be setup to listen.

To make the client run, you need to:
- make a “socket” number
- “bind” the socket number to an actual spot
- try to “connect” to a server
- send data back and forth (“read” & ”write”)
- (close connection at end)
Sockets

(see: server.cpp)
(see: client.cpp)
WHAT IS YOUR ADDRESS?

173.168.16.11

NO, YOUR LOCAL ADDRESS

127.0.0.1

I MEAN YOUR PHYSICAL ADDRESS!

28:05:FF:58:31:05