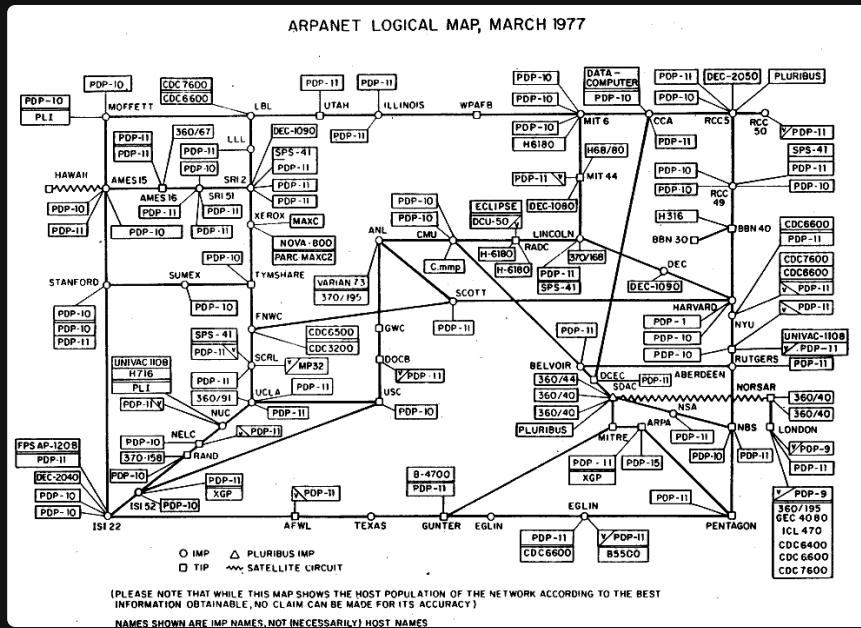


How the internet works

History of the Internet

The internet started around the 1960s from a US-army-funded research project which evolved into public infrastructure in the 1980s.

The way it works hasn't changed much since then.



A simple network

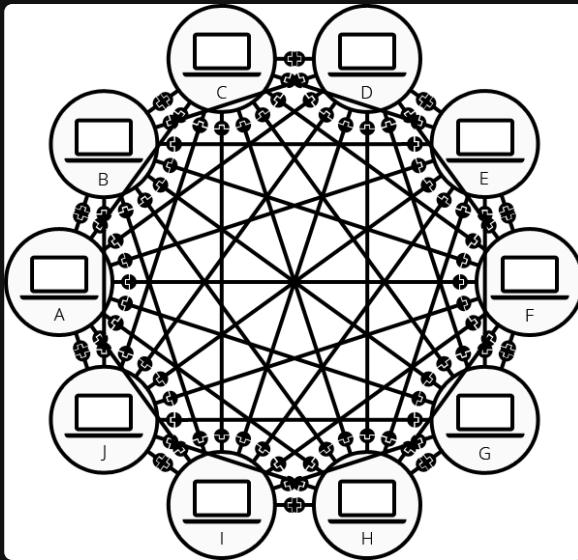
When two computers need to communicate, we need to link them, either **physically** or **wirelessly**.



You can now send data between the two computers.

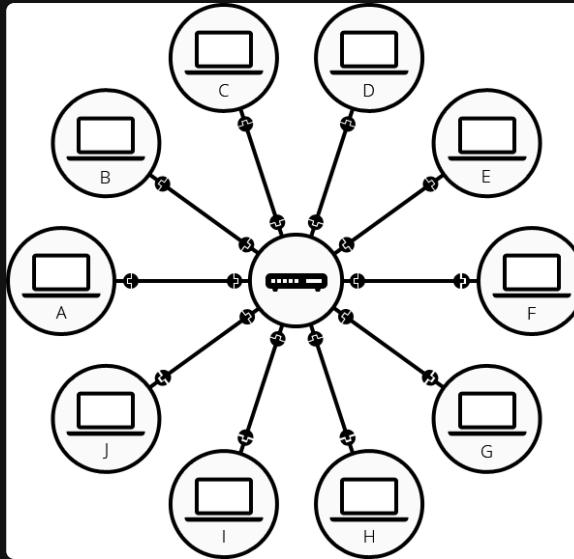
A "simple" Network

And you can simply connect as many computers as you want in a network.



Network Switch

To solve this problem, we use a **network switch**.



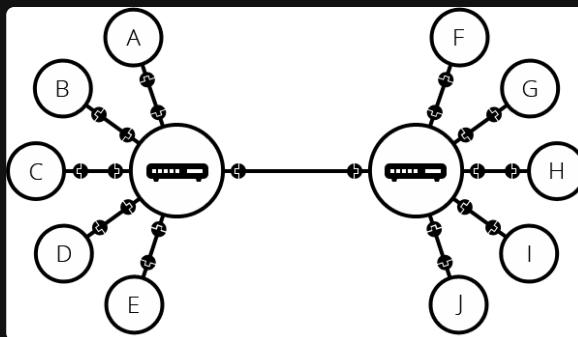
A **network switch** is a special computer that acts like a traffic controller.

So to send a message from A to B, then A sends the message to the switch, and the switch forwards it to B.

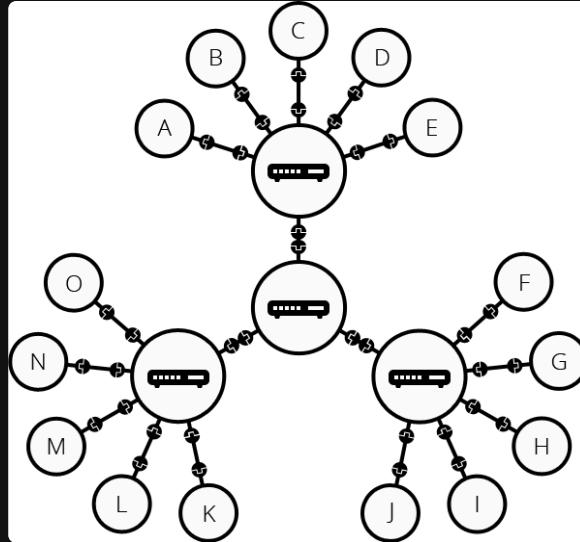
A network of networks

A single network switch can only scale so much, so if we wanted to connect even more computers, we simply **connect computers again**

A network switch is a computer, so we can connect it to other network switches.



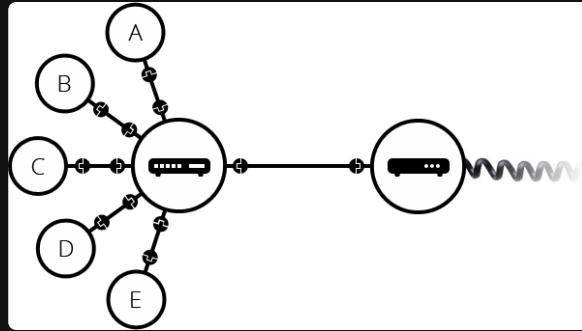
Even more networks



In reality, this approach to connecting computers present two major problems:

1. latency
2. failure points

Routers



To solve this we connect a **local** network (meaning computers from one switch) using something called a **router**

The router acts like a post office, it's main job is to send messages between networks (between other routers). And it sends things based on an **ip address**.

When a computer sends the router a message, the router reads the address of the destination computer, and decides the best way to send the message.

This is **close** to how the internet works

Modem

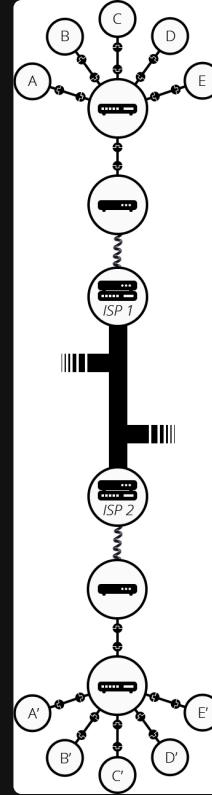
Now all we need to do is to connect all our routers, this infrastructure already exists

So we connect our local network to a **modem** which connects to the internet service provider (**ISP**) infrastructure.

(note that most commercial routers is usually a combination of a network switch, a router and a modem)

And the ISP have access to all the other routers connected to their infrastructure

But it can also access other ISPs infrastructure



Finding computers

To send a message to another computer, you have to specify its **address**.

This is called an **IP address** (Internet Protocol address).

It's a series of numbers and dots that uniquely identifies a computer on the internet.

```
1 192.0.2.172
```

Try out

```
1 142.250.190.78
```

The internet vs The web

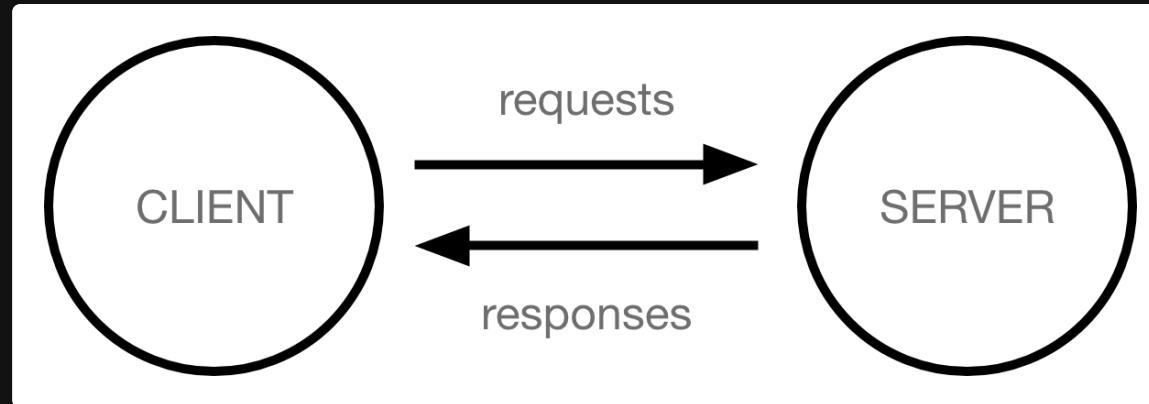
The internet is the **infrastructure** that connects computers together.

The web is a **service** that runs on top of the internet.

How the web works

Clients and servers

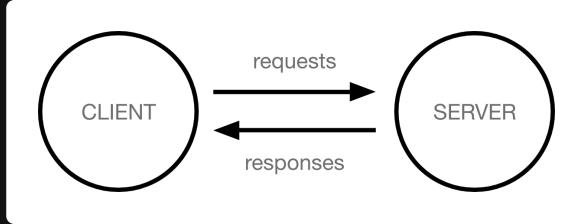
The core parts of the web are computers either called **clients** or **servers**.



They are **both** computers, and can both be clients and servers at the same time.

But for the purposes of this course, we'll treat them as static states

Client Server Interaction



1. The client sends a **request** to the server
 - usually by using a piece of software called a **web browser**
2. The server receives the request,
 - note that a server is simply a computer
 - in that computer there exists files
 - when the server receives a request, it finds the requested file
 - then it **responds** to the client with the file
3. The client **receives** the response
 - then the **web browser** displays the file to the user

try `ctrl + s`

Other Tools Needed in the Web

If we imagine the internet as a **road**,

- and on one end we have the **client** (your house)
- and on another end, we have the **server** (a shop)

To get **data** (*goods*) from the server (*shop*) to the client (*your house*), we need a few things:

1. The road itself (*internet*)
2. the transport mechanism, like walking, biking, driving (*TCP/IP*)
3. The address of the destination (*DNS*)
4. The language we use to ask for the goods (*HTTP/HTTPS*)
5. The goods themselves (*files*)

TCP IP

Transmission Control Protocol / Internet Protocol is a **protocol** that defines how data is sent and received over the internet.

It guarantees that data sent from one computer to another arrives intact and in the correct order.

Method of transport and organization of data that both sides agree with

DNS

Domain Name System is like the phonebook of the internet.

It **translates** human-friendly domain names

`www.google.com` into IP addresses `142.250.190.78`

A DNS is already **built into** your operating system and web browser, so you don't have to worry about it.

It's basically a website that tells your browser where to find other websites.

howdns.works/ep1/

A way of finding the address of a server given its name

HTTP

Hypertext Transfer Protocol is the protocol used for transferring web pages on the internet.

When you type a URL into your web browser, it sends an **HTTP request** to the server hosting that website.

This request is the **format** that both the client and server understand to communicate.

It includes information like:

- the method (GET, POST, etc)
- headers (metadata about the request)
- body (data being sent, if any)

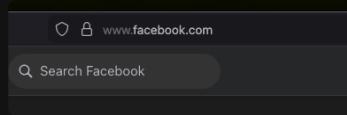
And other things

The language both sides agree to use

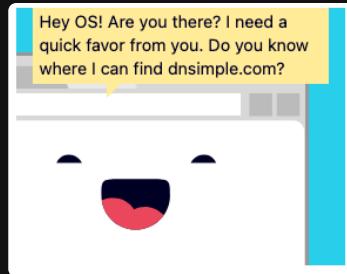
So what happens exactly?

Process

1. You type in a URL in your web browser



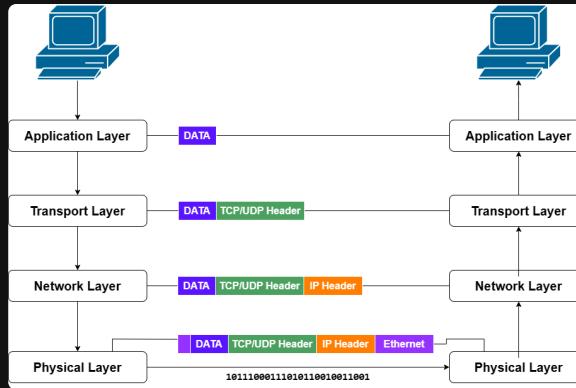
Your browser then goes to a **DNS server** to find the IP address of the server that hosts the website



Process

2. The browser gets that IP address back, then it sends an **HTTP request** to that IP address

When it's being sent along, it's using the **TCP/IP** protocol to get there



3. The server then responds with a 200 OK,

Meaning that file **exists**, they've done the processing they needed to do ,and you can look at it,

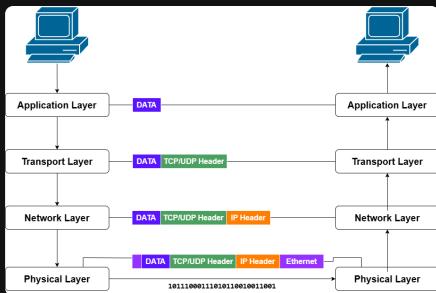
● **200 ok**

Process

Then starts sending the website's file back to your browser in small chunks called **packets**



4. The browser **assembles** those small chunks into a complete page and displays it to you



Case Study

Instapay

Terminology

QR Code

A way to **encode data** in a visual format that can be easily scanned and read by devices like smartphones.

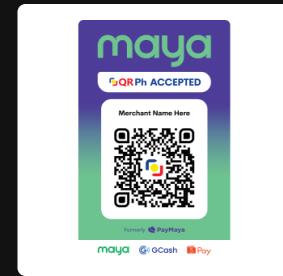
this is a way to store data visually



QR PH

A national standardized qr system mandated by **Bangko Sentral ng Pilipinas**

This standard allows **interoperability**



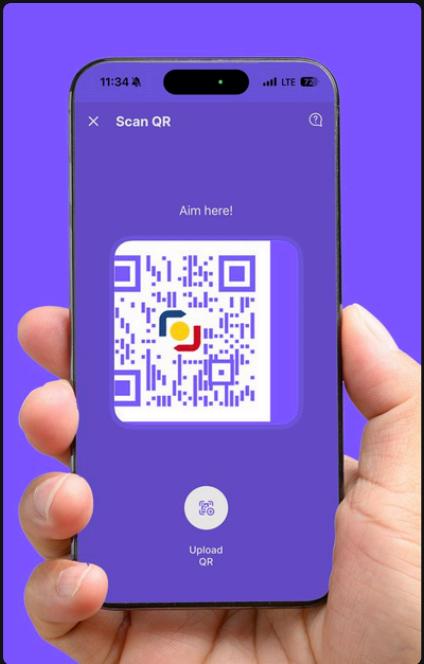
Instapay

Is a real-time fund transfer service owned by **BancNet**

This is a service that does the actual transfer of funds between banks



What happens when you scan



When you scan the QR code using your bank's mobile app,

It reads the data encoded in the QR code, which contains:

- the recipient's bank information
- the amount to be transferred
- a reference note
- etc.

Then your bank's app sends an **HTTP request** to your bank's server with that information

Then the bank app makes a request to BancNet's server to initiate the transfer **with** that information

Server Process

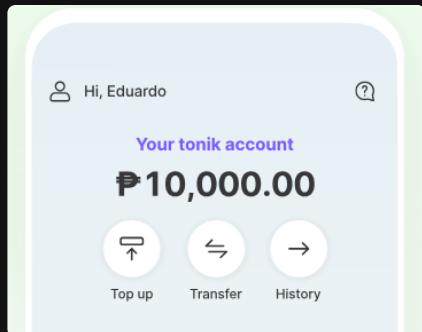


BancNet's server then **processes** the request, verifies the *details*, and initiates the fund transfer between the banks involved.

Then BancNet's server *responds* back to your bank's server with a **confirmation** of the transaction status, which it then forwards to your bank's app.

Then your bank's app **receives** that data

And finally, **displays** the confirmation to you



Big Picture

1. send
2. receive
3. process
4. respond
5. display

If any of these steps fail, the status of the transaction will depend on which step failed