Web Development

How the Internet Works

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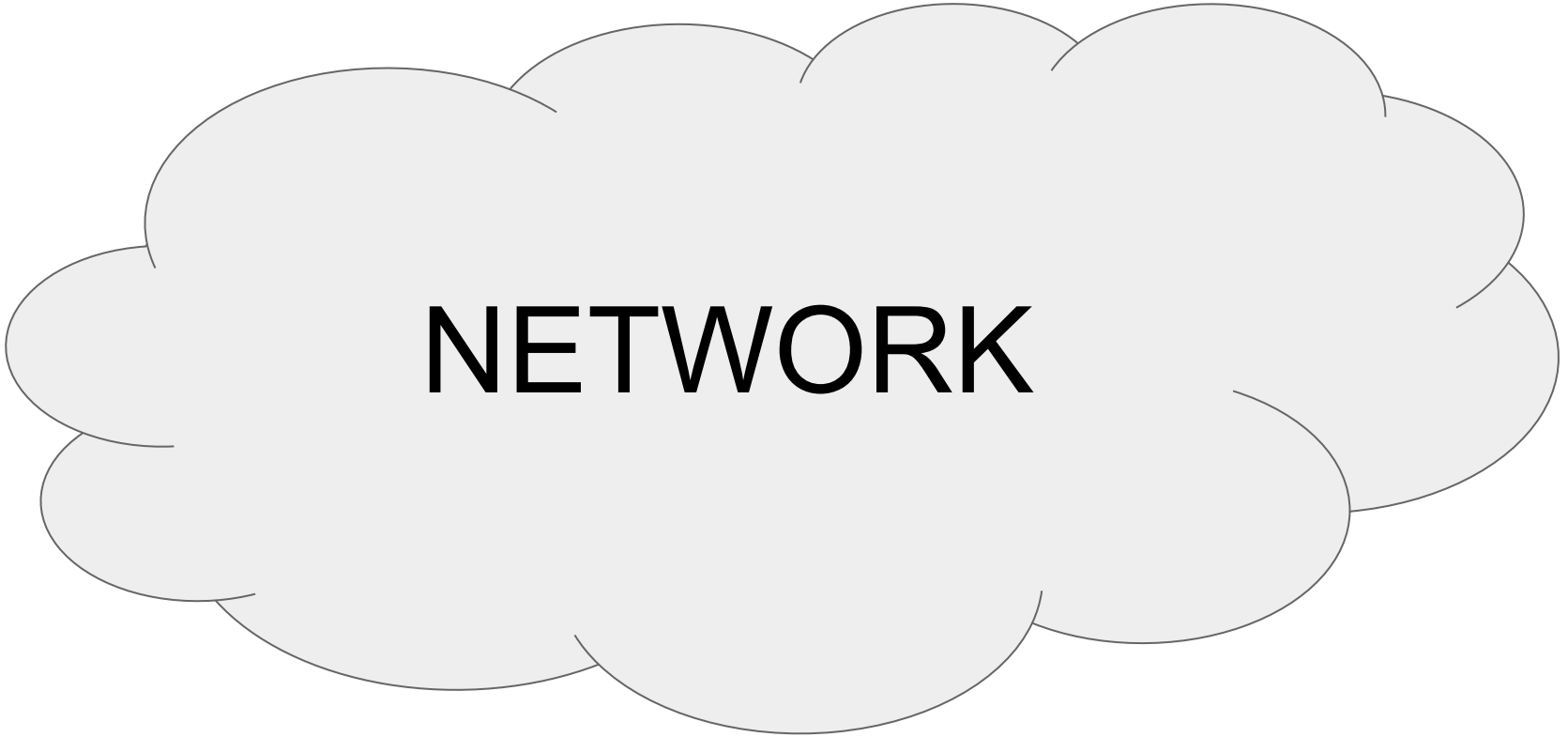
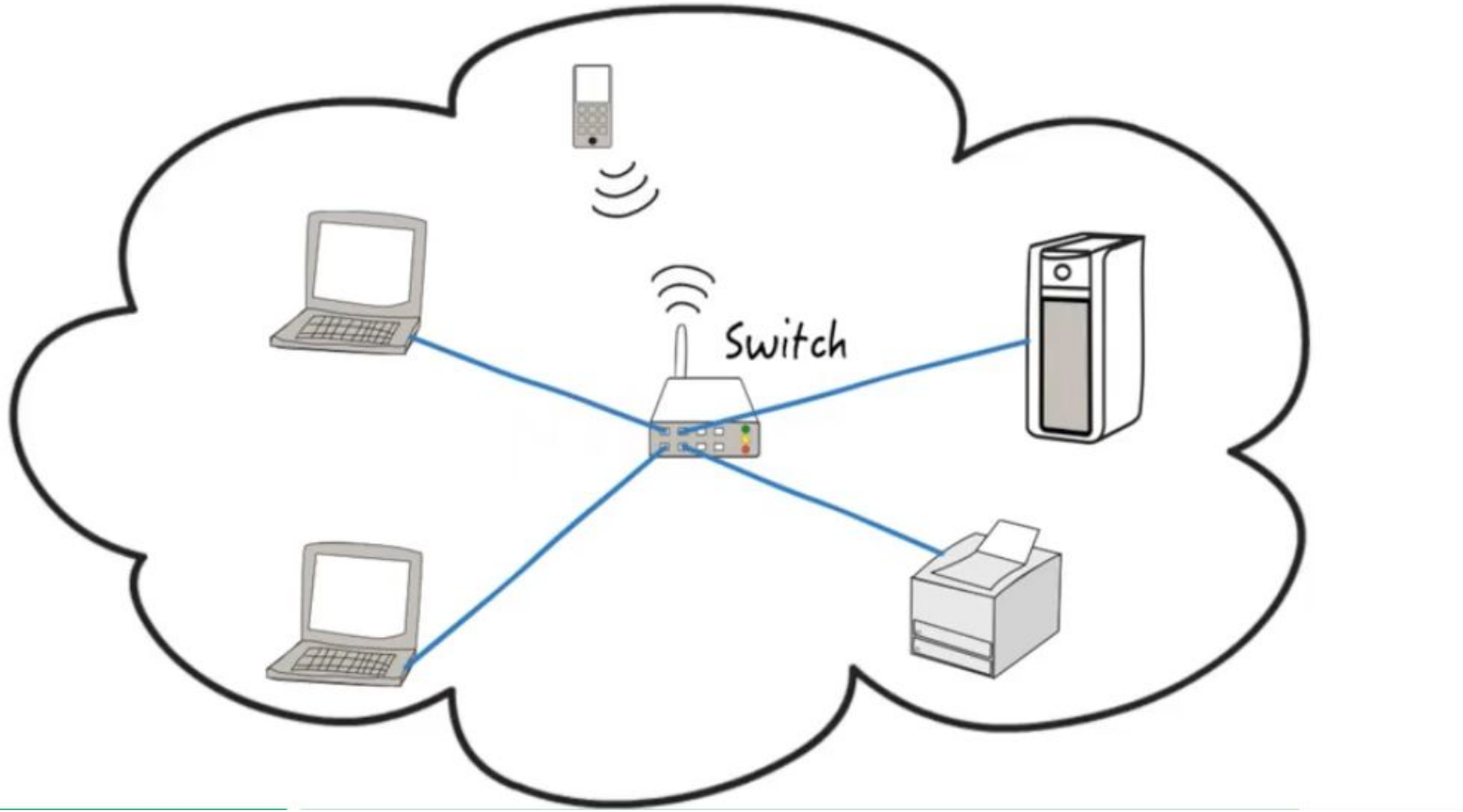
NETWORKING CONCEPTS

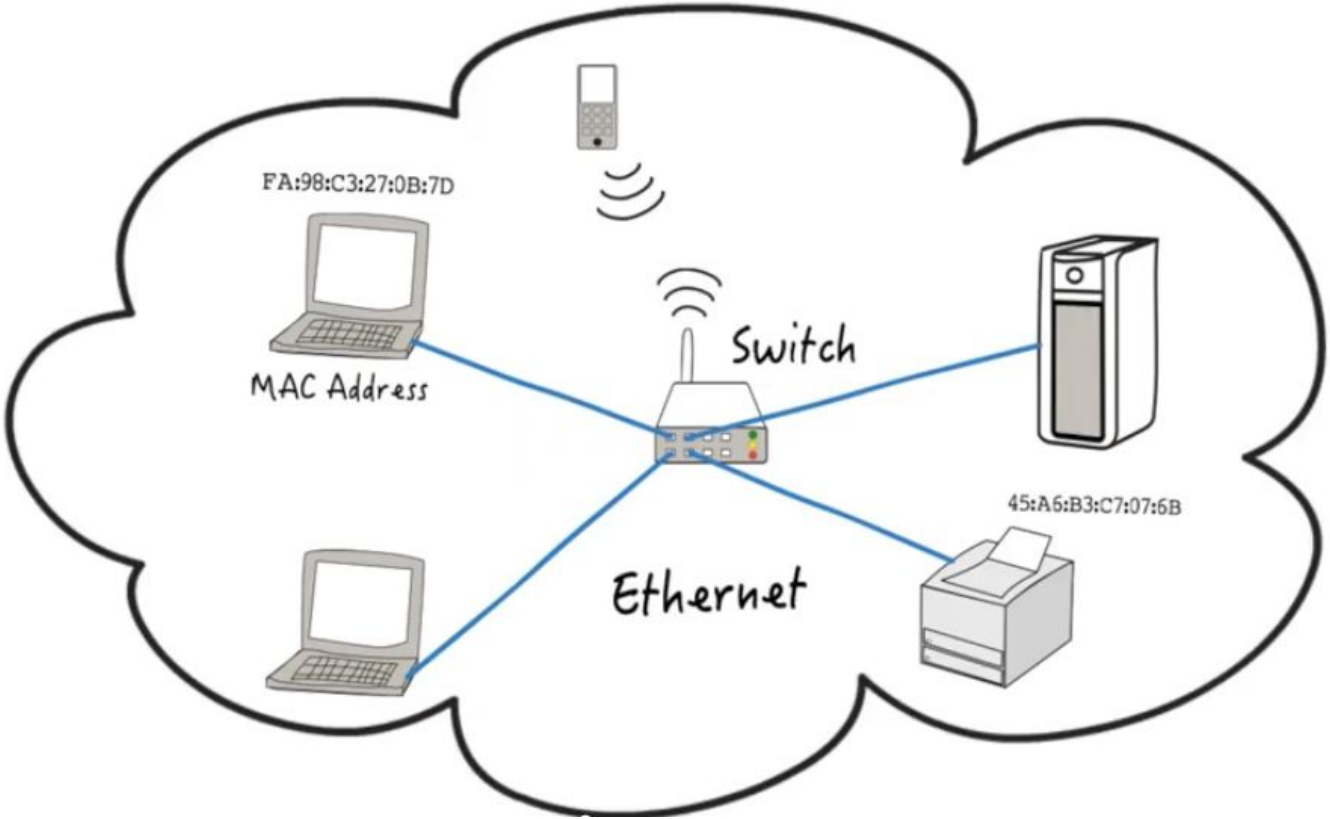
https://www.coursera.org/learn/web-app/lecture/105y5/video-1-networking-concepts



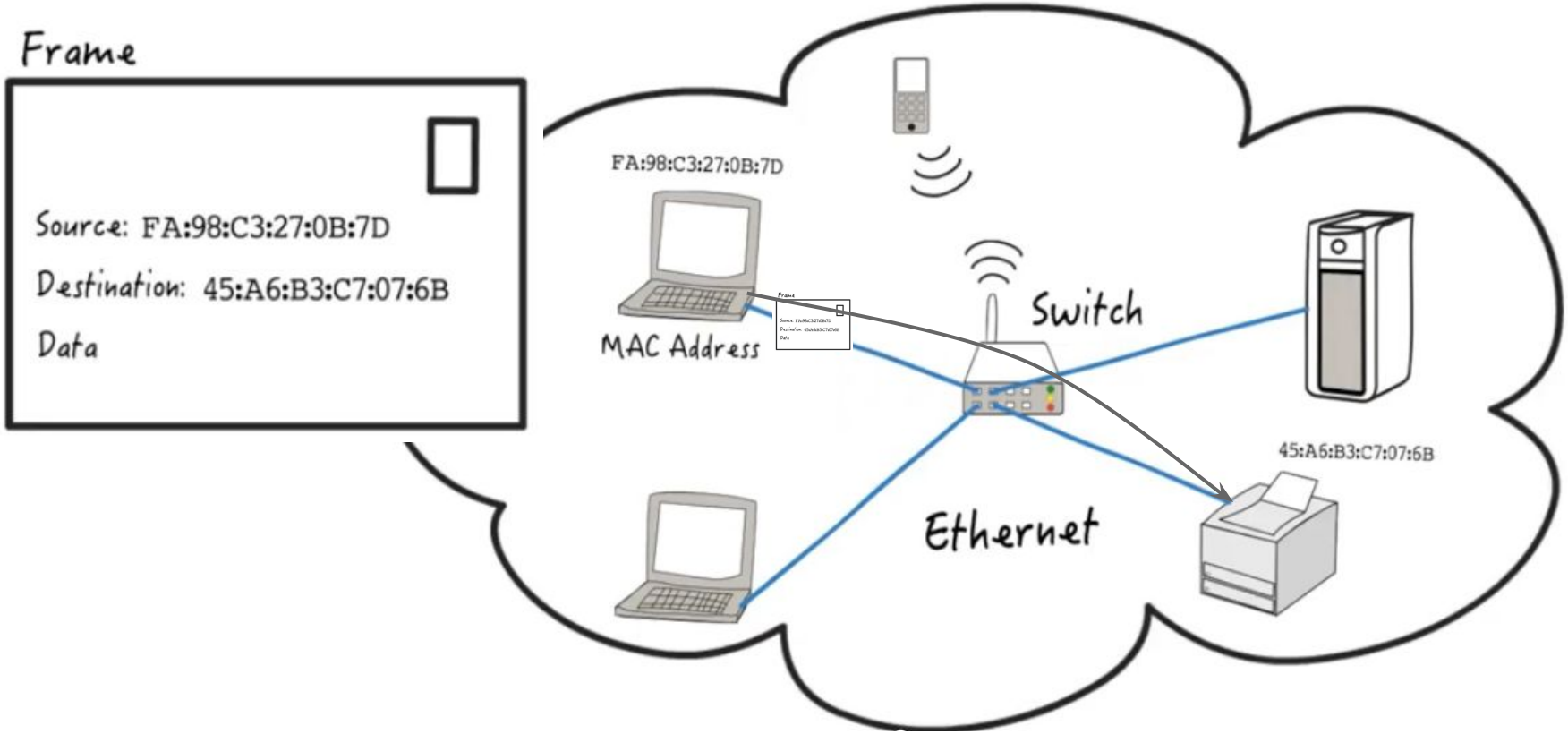
Most of us could imagine the Network as a cloud where devices communicate with each other.



The most common type of network you may know is a LAN network. In this network you can communicate over a wire or wireless connection. This type of communication you may find at home

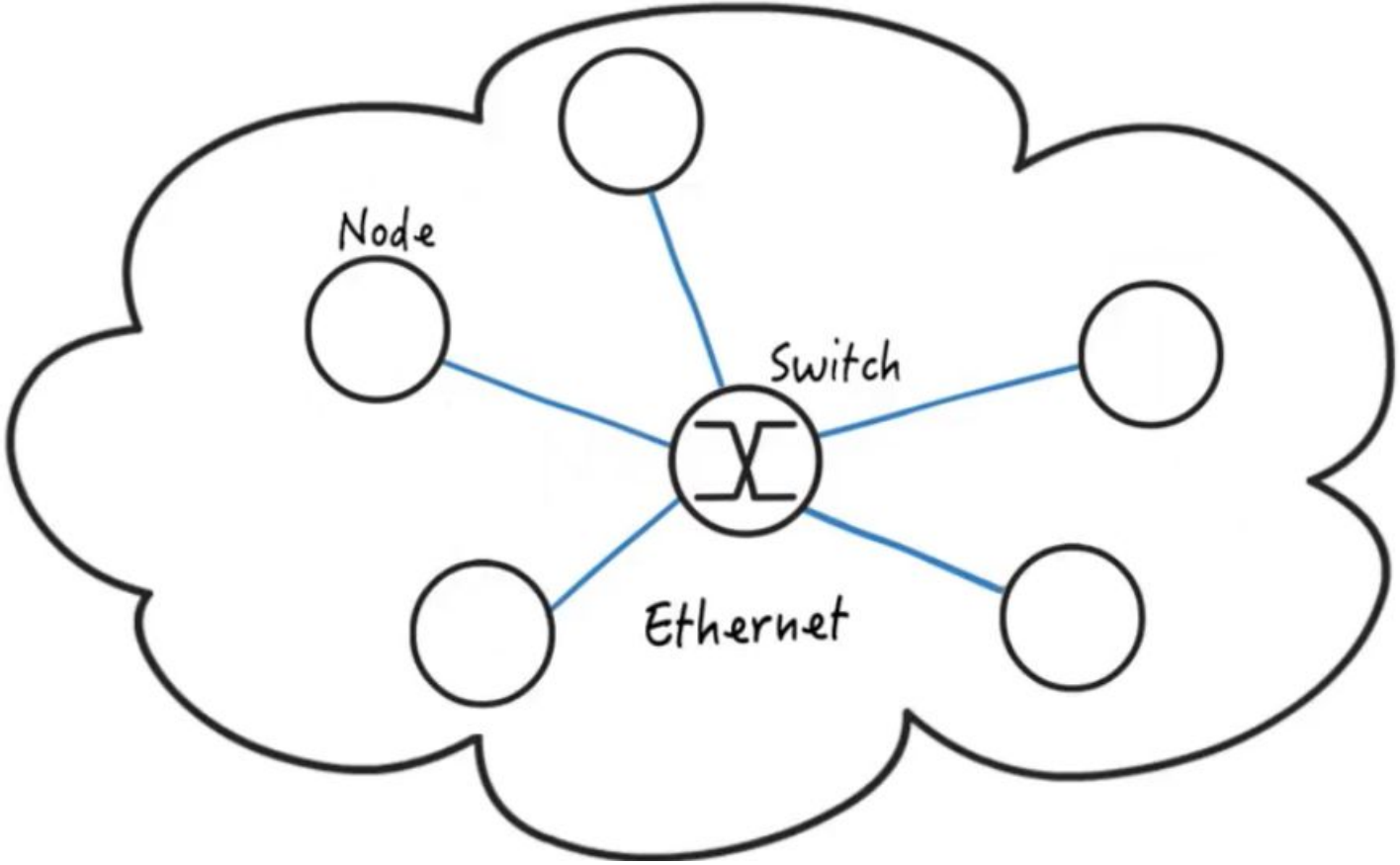


With ethernet, you have a **MAC address**, and it's just a sequence of hexadecimal numbers, so if this computer wanted to communicate with this printer, it will do that by using the MAC address of that printer. **Inside the switch, there's a table that stores the MAC address** of all of the devices that are on the network.



The information you want to sent gets packet into frames, this frames have useful information like the source, destination and the data itself.

This frames are sent to the switch and the switch knows how to redirect this information to the proper device.



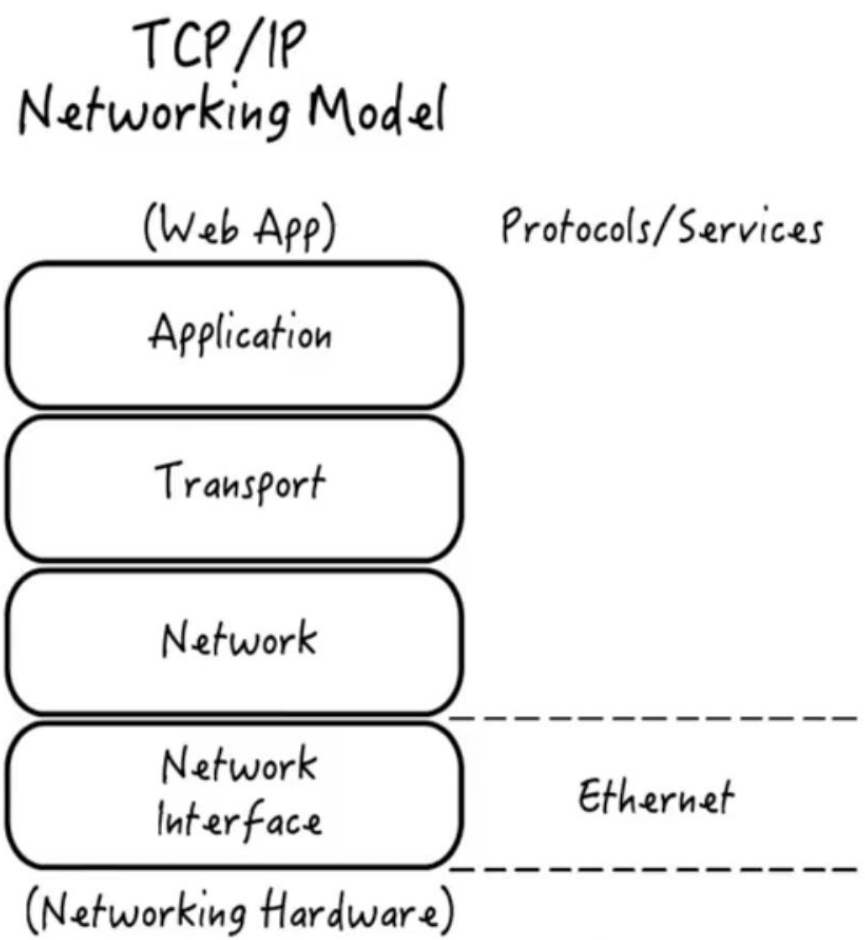
Most of the time you will see a representation of a computer network as Nodes.

The TCP/IP

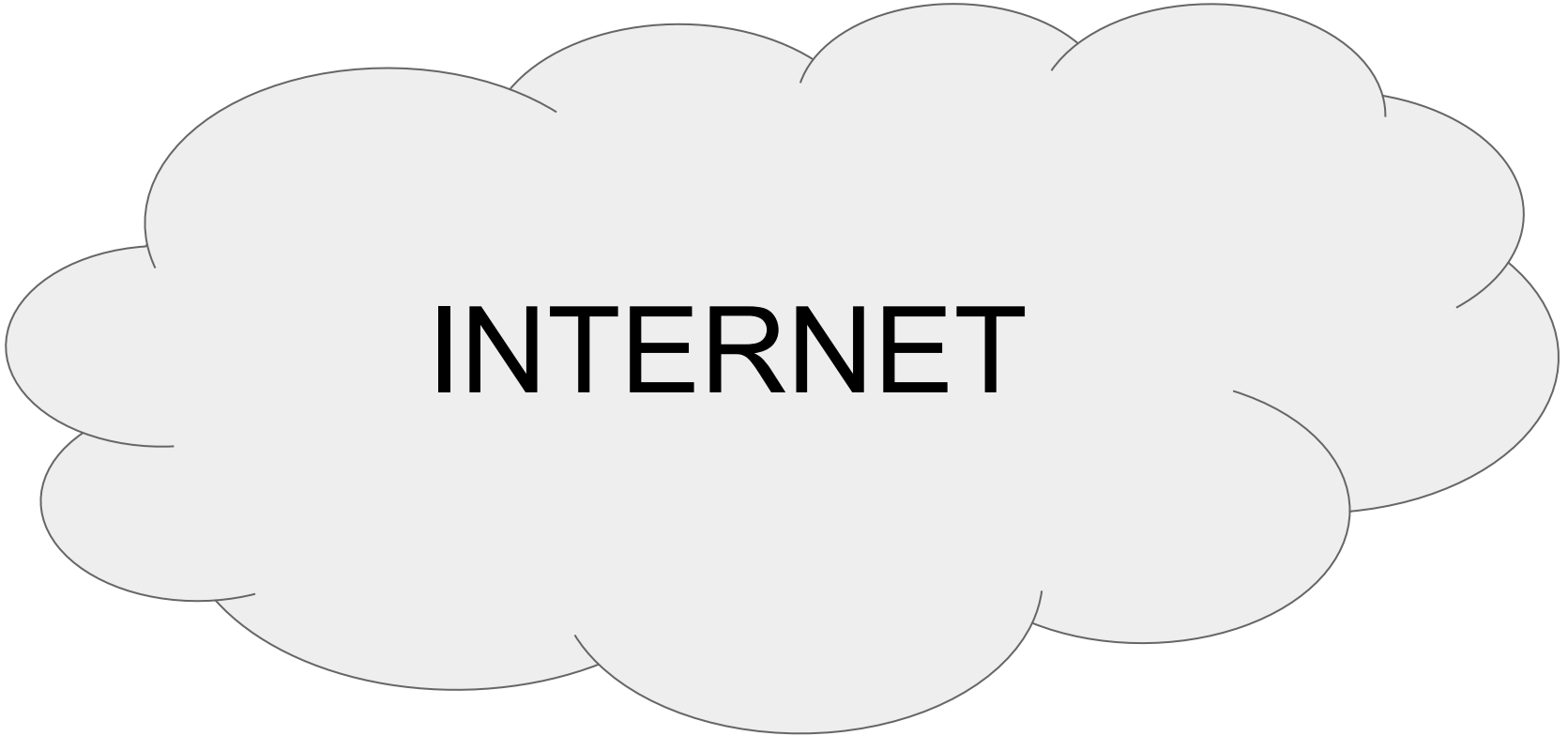
There are four stacks, or four layers.

The Network Interface layer which is where the Ethernet protocol lives.

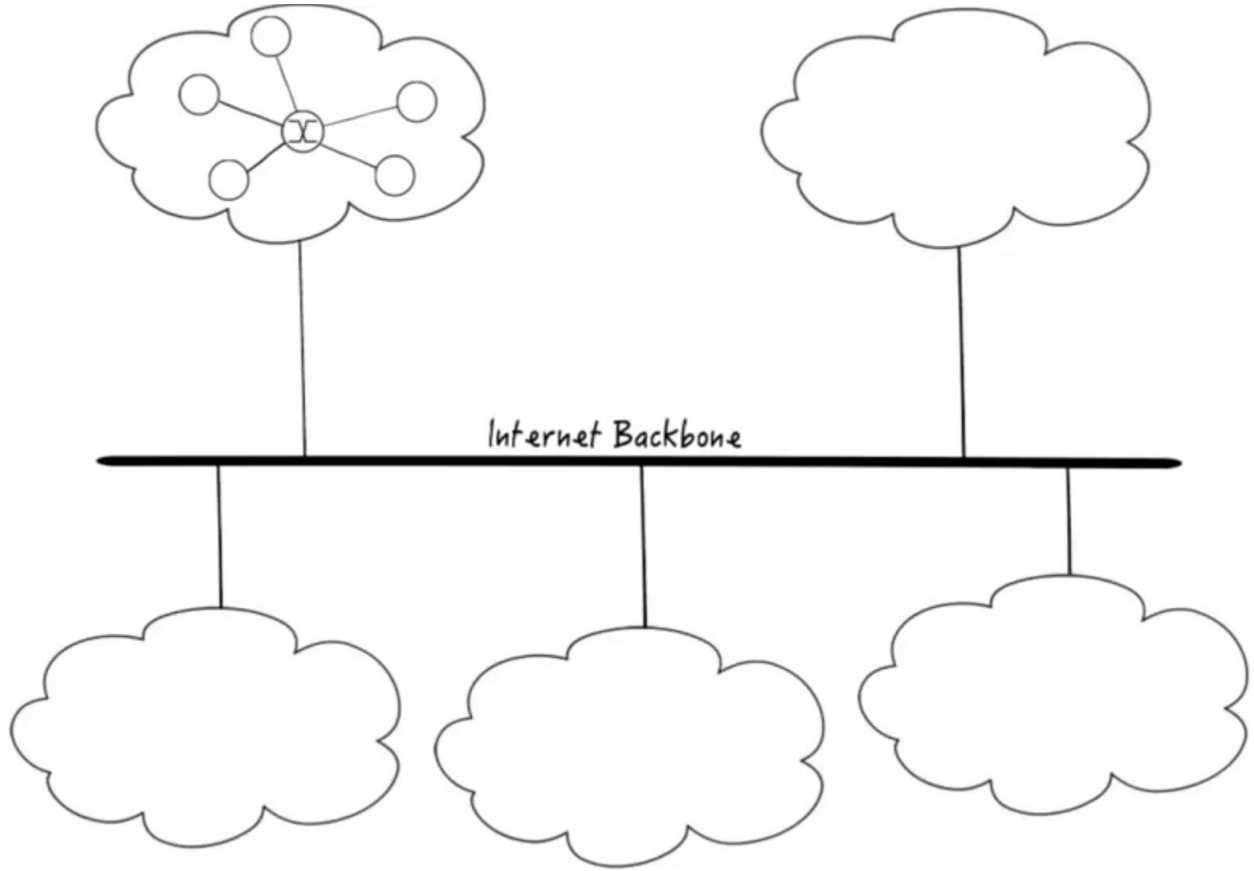
In the top layer we find the Application layer, this is where the Web Server and application is executed.



THE INTERNET



We can also think of the Internet as a cloud the same we did for a local area network. This would be an abstract representation of it.



We can see the internet as a collection of networks (like the one we studied before) all connected the the “Internet Backbone”

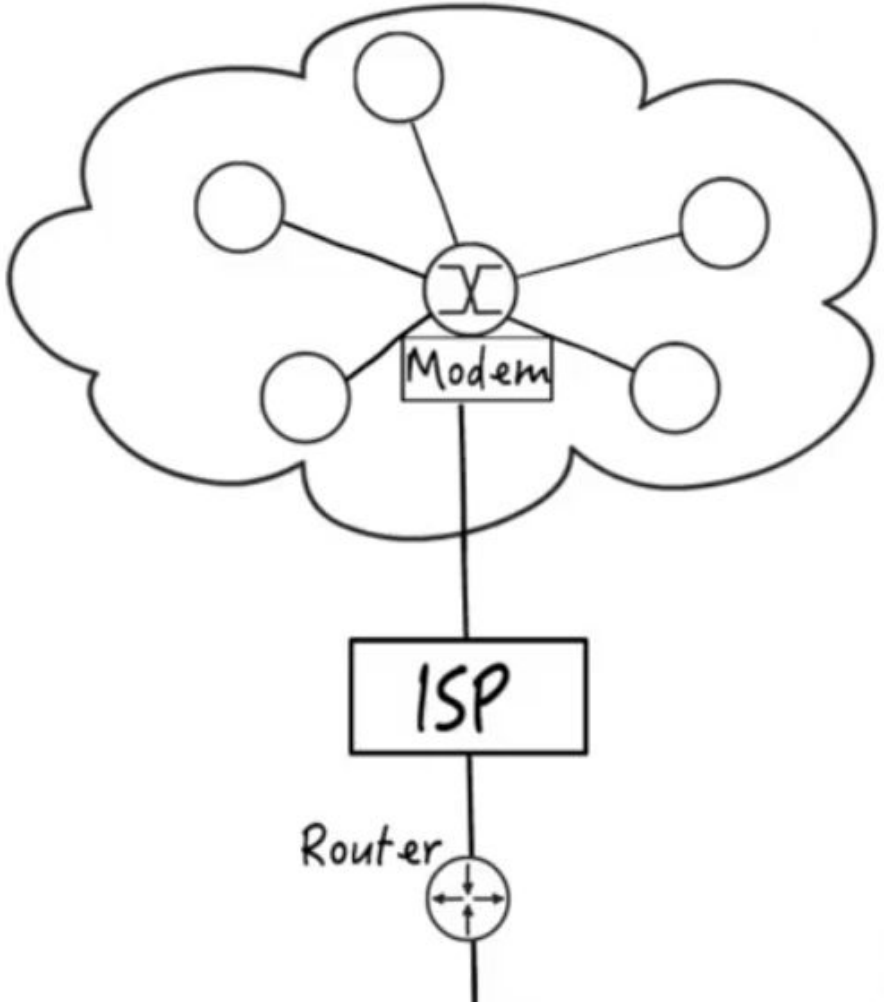
A backbone map of the Internet was created by The Opte Project using something called Traceroute, which actually goes over every sequence of the Internet and creates a visual trace.

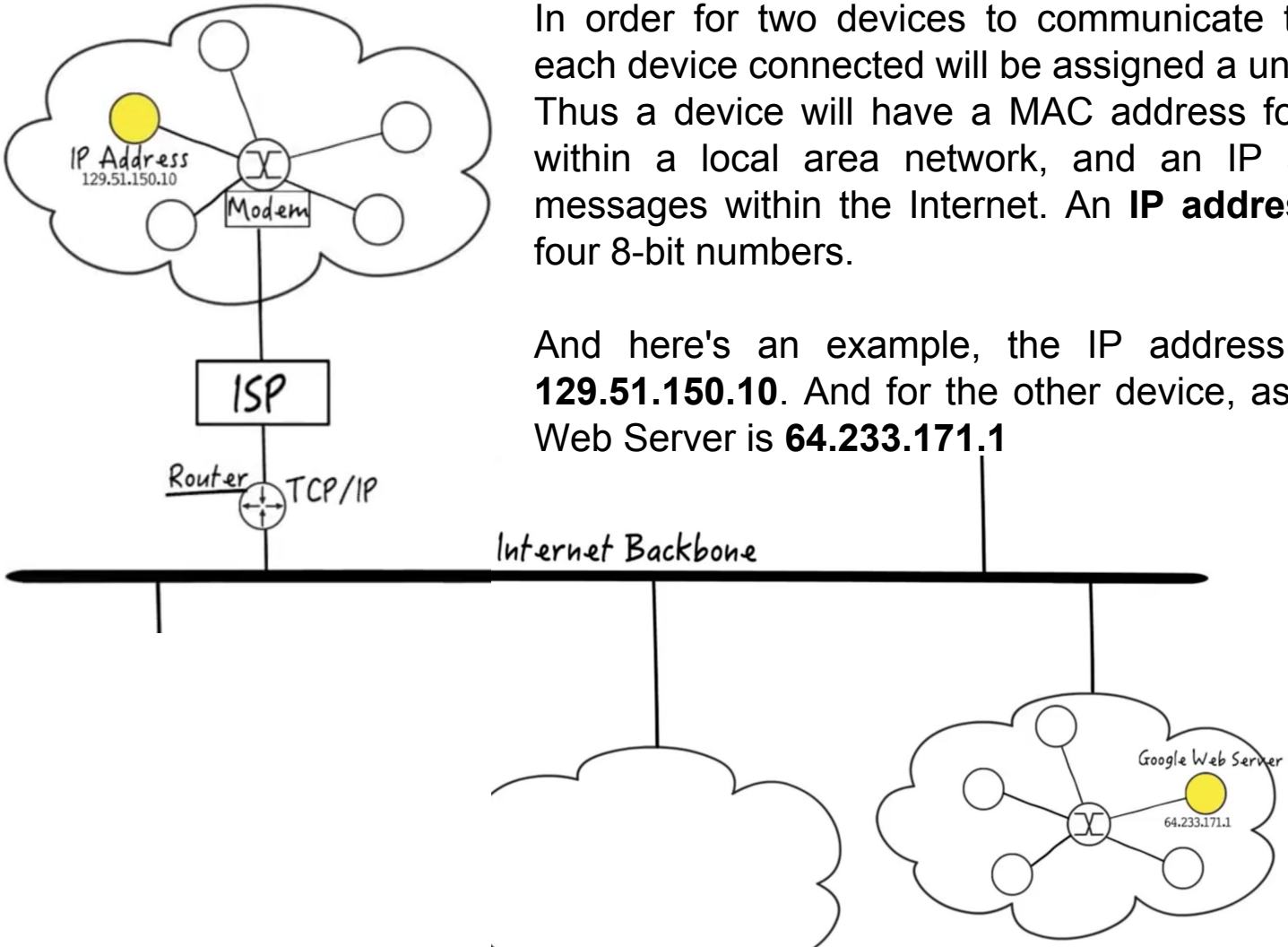
If you take a look at it, you can see it's color-coded by region. And you can just see the massive, massive size of the Internet backbone. There are literally millions of computers and millions of connections that make up this Internet backbone. And notice this is as of 2015.

http://www.opte.org/the-internet/

The network that you have at your house is generally connected to the Internet through an Internet service provider(**ISP**). And this is generally accomplished through a **modem** that you will also have your house.

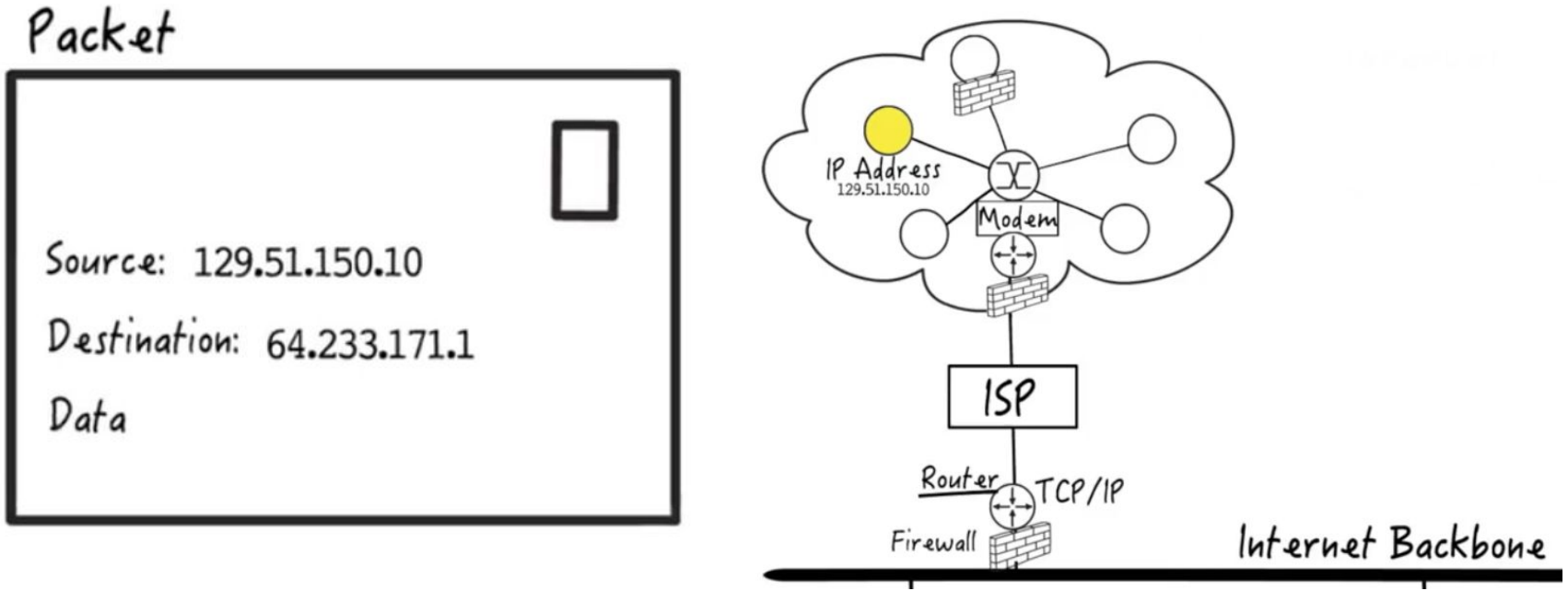
And between every two networks on the Internet a **router** must exist.



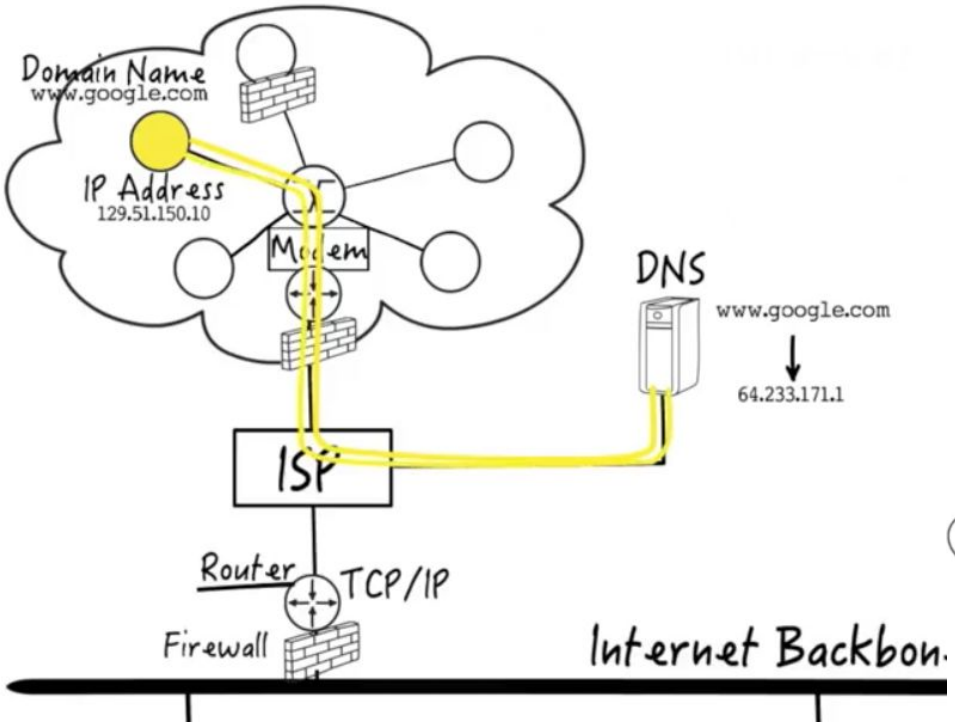


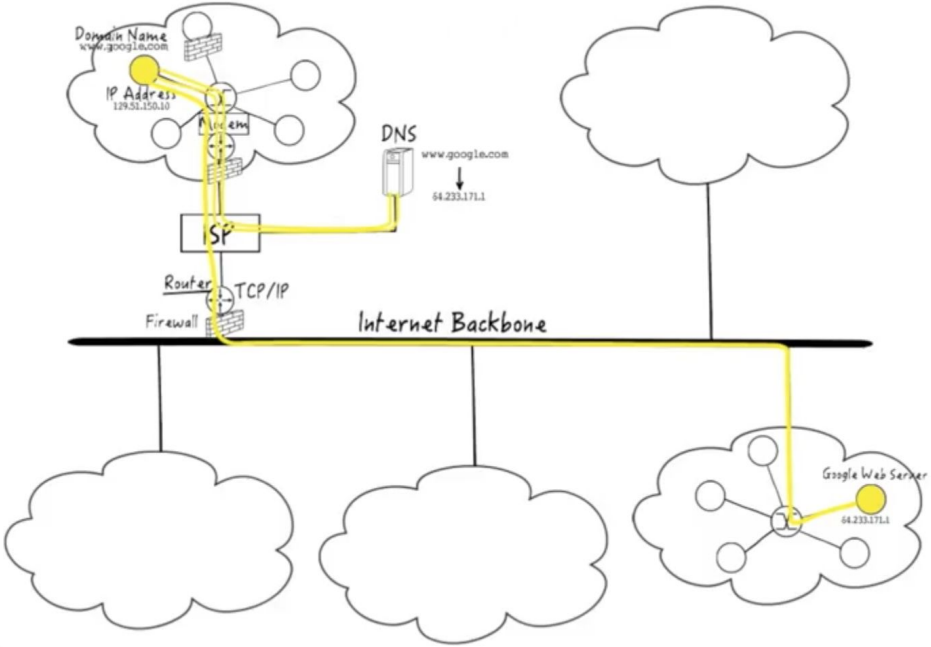
In order for two devices to communicate through the internet each device connected will be assigned a unique **IP Address**. Thus a device will have a MAC address for routing messages within a local area network, and an IP address for routing messages within the Internet. An **IP address** uses **32 bits**, or four 8-bit numbers.

And here's an example, the IP address for this device is **129.51.150.10**. And for the other device, assuming is a Google Web Server is **64.233.171.1**

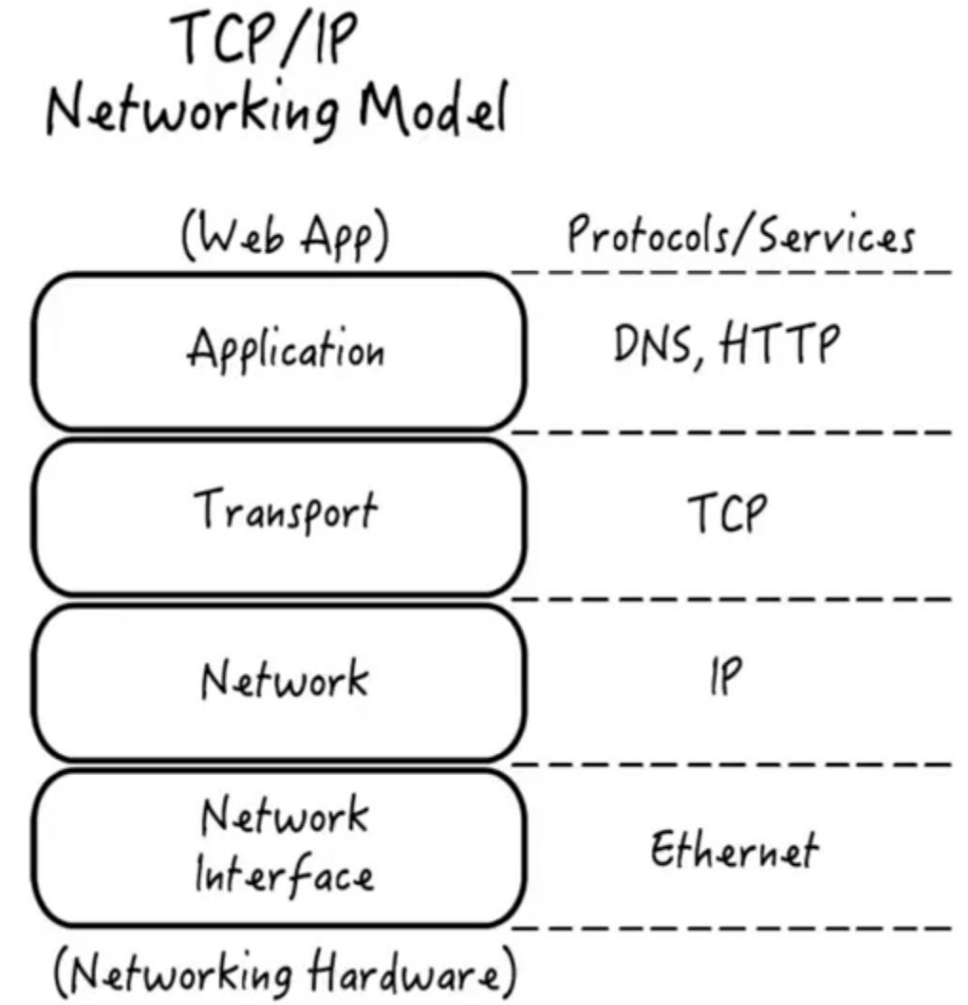


Now, how does a message go from one to the other? Well, this router uses a protocol that's called **TCP/IP**, and TCP/IP is very similar to ethernet, it breaks a message up into packets.
This packet has a source address, and in this case, it's an IP address rather than a MAC address, and it has a destination address and data.
A **firewall** is a system designed to prevent unauthorized access. So it can be implemented at hardware, software, sometimes a combination of the both. And they also exist throughout the Internet. They'll perhaps be one as a part of your router. It could be attached to a given machine within the network that could be anywhere in the network.





If I want to go to that Google server, I'd type into my browser www.google.com which is the **domain name**. Now this has to get translated into the proper IP address. And the way that happens is by using something called a **domain name server** or **DNS**, there are DNS servers all over the Internet, and what they do is simply map a given domain name to a given IP address. And what will happen is, when you type in www.google.com, it will query your ISP's DNS using the domain name server attached to it, and the proper IP address will be returned allowing you to send a message to this server that's on the other side of the Internet some place.



The **Internet Protocol** defines how computers can get data to each other over a routed interconnected set of networks.

The **TCP** protocols, which stands for **Transmission Control Protocols**, define how applications can create reliable channels of communication across a network.

So IP is concerned with addresses and routing, and TCP is concerned with communicating without corrupting or losing data. And so together, the TCP/IP protocols are what route messages and packets through the Internet for you.

At the highest level of this model, we have two protocols. We've got the DNS protocol and we also have the HTTP protocol, that sits at the application layer of this stack.

INTERNET HOT TOPICS

HOT TOPICS OF THE INTERNET

- NET Neutrality
- Security and privacy
- Cloud Computing
- Big Data and Analytics

One of the most controversial current hot topics associated with the Internet is **Net Neutrality**. Net neutrality is the principle that all Internet traffic should be treated equally. That is, that Internet service providers and governments should treat all data the same on the Internet, not discriminating or charging differently by user, content, site, platform or application, the type of equipment attached or the mode of communication.

Security and Privacy: With more and more valuable information available via Internet like banking, credit card transactions, Facebook information, how do we secure private data, and how we ensure that malicious people cannot use this information to exploit us.

Cloud computing is changing the way we develop web applications. Cloud computing's a type of Internet based computing where shared resources, that is computing cycles,storage or services are provided on demand. That is, you only pay for what you use, and they automatically scale according to your needs. Cloud computing allows you to avoid upfront infrastructure cost that in the past made it very difficult to build and maintain web applications.

Big data and analytics: With the massive amount of data being collected through all sorts of sensors, including the Internet of things, we now have an unprecedented ability to analyze data and discover new facts. This allows companies to make better informed business decisions, but this also allows collection of data about how individuals are browsing the worldwide web, so that ads can be targeted towards them, and individually tailored offers of product and services can be made as well.