# How the Internet Works

*by Sophia*

WHAT'S COVERED

In this lesson, you will learn how networks and computers make up the Internet's infrastructure. You will also be introduced to communication protocols that define how information moves through the Internet. Then you will learn how computers request resources over networks.

Specifically, this lesson will cover the following:

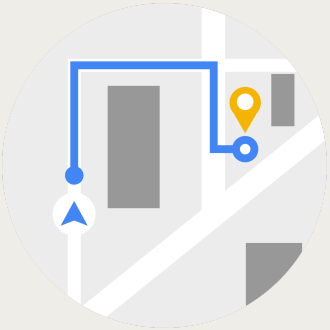


## 1. The Internet Platform: Networks and Computers

The terms *Internet* and the *World Wide Web (WWW)* are often used interchangeably, but they are not the same. The Internet is the technological infrastructure that makes it possible for users to access information on the WWW. At its simplest, the Internet is a very large **computer network**—a group of interconnected computers that can communicate all together.

**IN CONTEXT**

Let's compare the Internet to the United States Postal Service. The postal service provides a system that allows us to send documents and packages to a specific mailing address. Businesses rely on the postal service to deliver packages to customers. In this way, the postal service is often referred to as the backbone of our economy. Like the postal service, the Internet provides a system that allows us to send and receive messages to specific addresses. The Internet also allows us to browse



the web and transfer files. In this way, the Internet is often referred to as the backbone of the web.

WATCH

Are the Internet and the World Wide Web the same thing? Answer that question and learn more about how the Internet works with this video.

KEY CONCEPT

When looking at the big picture, the Internet is a vast architecture of computers, networks, and software that provide a platform for much of the technology that we use today. Without it, our access to data, information, news, friends, and family would be severely limited.

TERM TO KNOW

**Computer Network**
Two or more computer systems connected together via communication media that use communication protocols to transmit data between each other.

# 2. Communication Protocols

Computers on a network typically use a set of rules, called **communication protocols**, that determine how data and information are exchanged between two or more devices. These rules define how data should be formatted, transmitted, received, and interpreted, ensuring that the communication is reliable, efficient, and standardized. This is how different computers, created by different manufacturers and running different operating systems, are able to understand one another on the Internet. As long as everyone follows the standards, they'll all be able to talk to one another.

**IN CONTEXT**

Communication protocols aren't exclusive to the tech industry. If you've ever sent a letter through the mail, you probably followed a set of rules dictated by your government's postal system. For instance, to ensure your letter gets delivered safely, you will put your letter in an envelope and add a stamp and the recipient's address in specific locations on the envelope.

The term *communication protocols* describes a broad category of protocols that define aspects of data exchange on a network. Connection-oriented protocols are one type of communication protocol used to ensure the accuracy and completeness of data communications. Connectionless protocols are another type of communication protocol that focus on speed rather than accuracy.

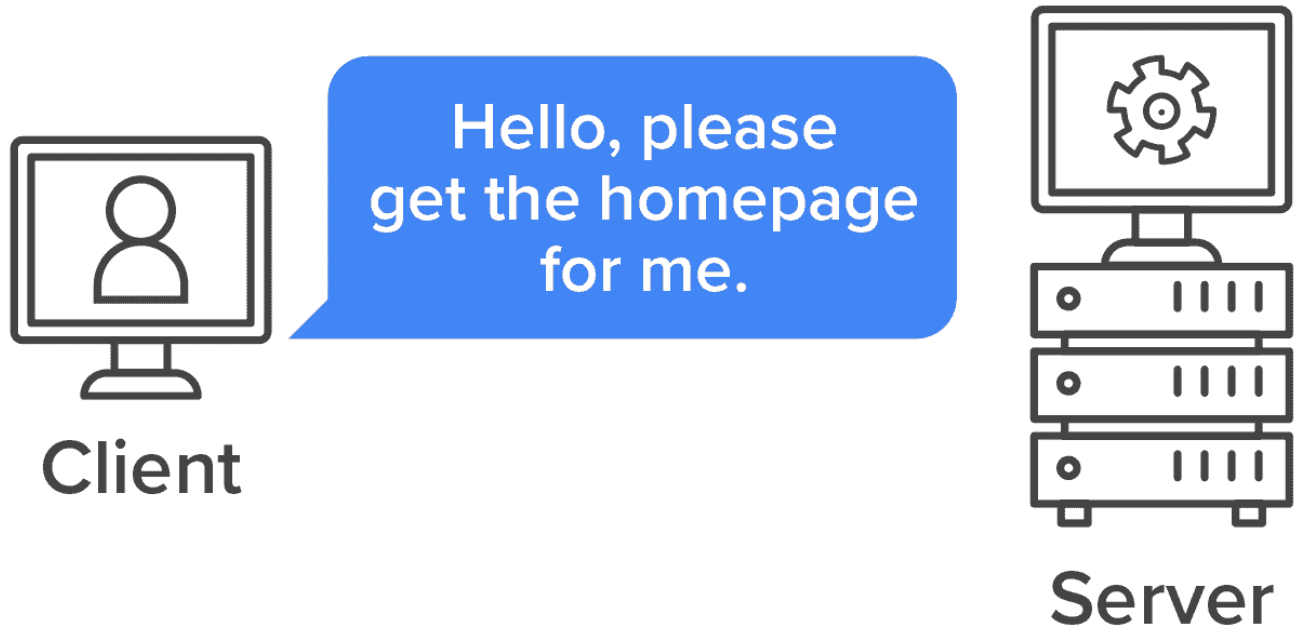
There are essential protocols that are dependent on supporting protocols to smoothly exchange information and resources between different systems. Together, these various protocols help to exchange and share information among different systems and make the process of accessing resources easier for the average user with less technical skill.

TERM TO KNOW

**Communication Protocol**
A set of rules used to define the communication method and process between electronic devices.

# 3. Accessing the World Wide Web

Computers that are connected to the Internet use software to access resources on the World Wide Web. Using a communication protocol, computers can either send requests for resources or reply with responses about the requested resource. Computers that send requests are called **clients** and the ones that respond are called **servers**. Clients send requests to servers. Servers can listen to requests and send responses back to their clients.




EXAMPLE Clients can make requests for information:
“Show me the webpage at sophia.org.”

EXAMPLE Clients can also make requests for the server to perform an action:
“Please enroll me in this course.”

EXAMPLE Servers typically respond with the information that the client requested:
“Here’s the code for the webpage at sophia.org.”

EXAMPLE Servers can also respond with a status message:
“You’ve been successfully enrolled in this course.”

EXAMPLE Servers may respond with information the client requested and a status message:
“Response status code: 200 (Successful)”
“Here’s the code for the webpage at sophia.org.”

**IN CONTEXT**

The term *server* might remind you of dining at a restaurant. When you go out and eat at a sit-down restaurant, you’re usually given a menu. Then, a waiter will come to your table and ask for your order. They pass your order along to the kitchen and when your food is ready, they serve it to you at your table. In this analogy, you are the client, and the waiter is the server. When you order food from the waiter, you’re making a request. The waiter accepts your request and, sometime later, responds with your food.

REFLECT

The scenario above is not a perfect analogy though. Most restaurants want to provide good customer service to their clients by making sure their needs are met and they have a positive experience. Restaurants usually adhere to a motto that the customer’s request is always right. As a result, waiters rarely decline to serve a customer. This is not how clients and servers work. On the Internet, the client is at the whim of the server. In other words, clients can’t tell the server what to do; they can only ask. Clients can request data from servers all they want but servers can always reject them. After all, it’s “requests”, not “demands”. This is how things like user authentication work.

**IN CONTEXT**

Let’s say you want to log in to your email account to check your messages. You enter your username and password into a form and click “Sign In”. When you do that, your web browser will send a request to your email server and ask, “Please authenticate this user. Their username is XXXXX and their password is XXXXX”. The server will check the username and password to make sure they’re correct. If the given password doesn’t match the one on file, the server will reject the request and, as a result, your login attempt will fail.

BIG IDEA

Clients send requests to servers. Servers can listen for requests and issue responses. A basic “conversation” between a client and server might look like this:

- **Client:** I would like to view the resource at Sophia.org
- **Server:** Ok, let me see if that resource exists... I found it! Here is the resource at Sophia.org; it’s a webpage, by the way.
- **(Client receives the webpage and displays it to the user.)**

Web engineers get to tackle the unique challenge of orchestrating the transport of data securely and precisely using a system that, at the most basic level, is pretty simple. The Internet we’re using today is, by and large, the same Internet we were using 20 years ago! Yet, we’ve made a huge amount of technological progress on the Internet since then, thanks to web engineers who were able to build complex software on top of a simple system.

TERMS TO KNOW

**Client**
A computer system or device that sends a request to a server over a network.

**Server**
A computer system or device that listens for and attempts to respond to and fulfill requests.

SUMMARY

In this lesson, you learned how the web works. The web works because it’s powered by the **Internet platform of computers and networks** that make up the Internet. Computers are able to talk to one another because they all adhere to **communication protocols** that organize and standardize computer communications. Finally, you learned about the process of **Accessing the World Wide Web** from the World Wide Web using a client computer.

Source: This Tutorial has been adapted from "The Missing Link: An Introduction to Web Development and Programming " by Michael Mendez. Access for free at https://open.umn.edu/opentextbooks/textbooks/the-missing-link-an-introduction-to-web-development-and-programming. License: Creative Commons attribution: CC BY-NC-SA .

TERMS TO KNOW

**Client**
A computer system or device that sends a request to a server over a network.

**Communication Protocol**
A set of rules used to define the communication method and process between electronic devices.

**Computer Network**

Two or more computer systems connected together via communication media that use communication protocols to transmit data between each other.

**Server**

A computer system or device that listens for and attempts to respond to and fulfill requests.