Welcome to the first week of WDD100! In this lesson, you will learn the fundamentals of the underlying technologies that make up the World Wide Web and the Internet.

The World Wide Web is truly an amazing tool that has literally changed our entire society, and it has changed our society in many different ways. First, it has fundamentally changed how we communicate with each other. In the past, the telephone and the mail systems were the dominant means of communicating over large distances. Now, we have social networks like Facebook, Twitter, and Google Plus. In addition, we have new means of communication. Tools like Skype belong to video communication as well as audio. The web has also fundamentally changed how business is operated. Now, we can sit in the living room and do all of our Christmas shopping without ever leaving the couch! The entire entertainment industry has been radically transformed because of the Internet also. Now, we can stream the latest movies, TV shows and radio programs over the Internet. In addition, with the advent of tablets and cellphones, the gaming industry has had to change also. It is now possible to purchase, download and play games directly from the Internet. Last but not least, the way we receive an education has also changed radically. Informal education has gone from books and libraries to Google and Wikipedia. And now, it is even possible to get an entire university education from anywhere in the world as long as you have the Internet connection. In short, our entire society has been directly impacted by the invention of the Internet and the World Wide Web.

To start learning the fundamental technologies of the Internet, let’s ask a simple question. Is there a difference between the terms Internet and the World Wide Web? The answer is yes and no! From a layman’s point of view, there is really no difference. We use the terms interchangeably. However, from a web professional’s point of view, there is a difference and the difference is significant. Technically speaking, the Internet is the collection of all the computers, servers, cellphones and other electronic devices that are all connected to each other. We sometimes show a picture like this to describe it.

[2 pictures]

In these pictures, you can see that one way to describe the Internet is just a whole bunch of computers that can send and receive messages to each other. The Internet connections between these computers and the software protocols that allow the computers to send and receive these messages are turned to network. In fact, this is where the term “Internet” comes from. It is the network of interconnected computers. So how many computers do you think are connected to the Internet? Although no one really knows for sure, in 2010, it was estimated that there were 2.5 – 3 billion computers connected to the Internet. China had the most with approximately 420 million people. All of Europe had almost 340 million, and the U.S. had 249 million people connected to the Internet. The interesting thing to know is that even though China has the most computers connected to the Internet, only 31% of the population is currently using it, and it’s also interesting to know that in India, only 7% of the population has Internet access. What this tells us is that worldwide, there is a still tremendous potential for many more people to start using the Internet. Just for curiosity sake, how many people do you think currently live on the Earth? It turns out that in 2012, the Earth’s population passed the 7 billion mark.

This is a really fascinating picture. It kind of looks like the images of the stars; however, this is really a picture of the Internet. This image is created by researchers trying to understand how the 3 plus billion computers on the Internet were all connected. This is essentially a map specifically showing which computers are connected to each other. If you zoom in on the map, you can see that each node on the map looks like this. As you can see, there is one central computer, which is called the server and has many computers connected to it. Each computer in this diagram is referenced to a unique number. These numbers are called the Internet Protocol numbers or IP numbers for short. To help understand this a little more, the computer you are listening to this lesson on would be equivalent to one of these nodes here. And the Internet provider you’re using to access the Internet would be equivalent to this node here. As you can see, the Internet provider you’re using not only has you connected to it; it also has many other customers. These are represented by all these other nodes here.

Let’s switch a little and discuss what the World Wide Web is. The World Wide Web is the collection of all the software that is installed on the computers connected to the Internet. It consists of all the web pages that are stored on the Internet as well as all the web browsers and the software used for communicating between computers. Previously, we said that it was estimated there were approximately 3 billion computers connected to the Internet, a truly big number. So how many web pages do you think it really exists on the web? The answer is no one really knows but it has been estimated that there are over trillion web pages that do exist. Regardless, there are many more pages on the web than anyone can visit. Its fact makes web businesses cringe. With so many web pages out there, how can you make sure that potential customers you know about can visit your website?

In the YouTube video describing how the Internet works, the terms Client and Server were described. Do you remember what the differences between them are? A good way to think about client or server computer is to think about a restaurant. In a restaurant, someone who is hungry comes in and gives their orders to a waiter or waitress. In this analogy, the client is the hungry person, and the server is the waiter or waitress. In the restaurant, the server then fulfills the order and the client is given what he/she requested. A very similar thing happens when we browse the web. In the Internet transaction, you and I sit down in our computers. We open the web browser and we type in the web address. When we hit the “Enter” key, we are acting like a client, we are asking for something specific. When we hit the “Enter” key, this web address is sent to a special computer called the “server”. The server then finds the information that was requested, and that information is then sent back to a client computer. Now, in an actual Internet application, this client server architecture is a little more complicated than the simple description I just gave. It turns out that because there are so many computers connected to the Internet and so many web pages on the web, it would require the computer request a specific piece of information, most likely it would not be on the server closest to the client. When this happens, the specific chain of event occurs to get the requested information. Let’s look at an example.

Let’s say the computer we’re using is located here and the web page we all want to look at is stored on the server here. When we type in a web address, a client computer sends that request to the nearest server. Since the server does not have the specific information, it asks another server for this information and since it does not have it, it asks the next one in the chain. And this happens until the server with the correct information is contacted. This server then sends the information back to the same channel in which it was requested, and eventually, the information gets back to the client computer. The amazing thing is that this happens very quickly. Most of the time with a fast Internet connection, you can pull up any web pages in the world within a couple of seconds. Now from the YouTube video and from your textbook reading, do you remember what the protocol used to request and send the data across the Internet is? The answer is HTTP or Hypertext Transfer Protocol. This HTTP is the common language that the computers use to send and receive this information. Every computer connected to the Internet uses this exact same language, regardless of whether this computer was built in the United States, in China, in Europe or wherever. They all use the exact same language called the HTTP. Now, related to HTTP, how does a computer know where to send data to? It turns out that every computer on the Internet has unique address. Just like an address for your house, for your apartment, this address uniquely identifies each computer connected to the Internet, and in fact, no two computers in the world have the exact same address. For computers, you call this address an Internet Protocol Address or IP Address for short. For computers, the addresses are strings of numbers. Each computer has unique numbers. For us humans, because we cannot remember long strings of numbers, we use more human-friendly format called the URL. A URL is formally called the Uniform Restored Locator, and sometimes we call them domain names. But they both really mean the same thing. A URL is nothing more than a text-based address you type in the browser like [www.lds.org](http://www.lds.org) or [www.byui.edu](http://www.byui.edu) or [www.google.com](http://www.google.com). When we type in these URL’s, these addresses are translated into strings of numbers that represent the IP addresses.

Now let’s talk about one part of the Internet that we interact with the most: the web browser. We always use web browsers, and in fact, you’re using a web browser right now that takes this class. Some of the more popular web browsers are Microsoft Internet Explorer, Mozilla Firefox, Google Chrome and Apple Safari. We all use web browsers, but do we really know what web browsers are? In a nutshell, a web browser is the computer program that does two main functions. First, a web browser requests information from the servers. For example, when we type in [www.byui.edu](http://www.byui.edu) into our browser, our browser requests that BYU-Idaho server to send us the information for the homepage of the BYU-Idaho website. When BYU-Idaho server gets the request, it will send that information back to the browser. When our browser gets this information from the server, our browser then receives and processes this information. As it processes it, our browser takes the information and formats the display so that the images show up properly and textual information is readable and understandable. So that’s really what a web browser does. It first requests information, and second, it processes the received information to make it readable and understandable for the users. Now to dwell in a little deeper, what kind of information does a browser request? It turns out that most of the time, it just requests a document that is stored on a server. These documents are mainly HTML documents or Hypertext Markup Language documents. In fact, in this class, we will spend a fair amount of time learning the fundamentals of HTML and how to create these documents. And even though most time our browsers will request the HTML documents, just to be complete, sometimes the browsers will request that the servers execute a program, and the browsers will take the output of that program and display to the users. So, in conclusion and as a review, there are three main technologies for the web. These are the Hypertext Transport Protocol or HTTP for short, the Hypertext Markup Language or HTML for short, and the Uniform Restored Locator or URL for short. HTTP is the standard protocol or language that is used for communication between clients and server computers. All computers use the same language. HTML is the language used for almost all web pages, and URLs are the addresses of all the web pages stored on the Internet. Together, these three technologies enable the amazing system that we call the Internet and the World Wide Web.