**WWW Introduction**

Understanding the web

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# Internet protocols

## TCP/IP

Transmission Control Protocol (TCP) is one of the main protocols in TCP/IP networks. Whereas the Internet Protocol (IP) deals only with data packets, TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent. Therefore, TCP/IP controls how computers (clients and servers) communicate over the internet.

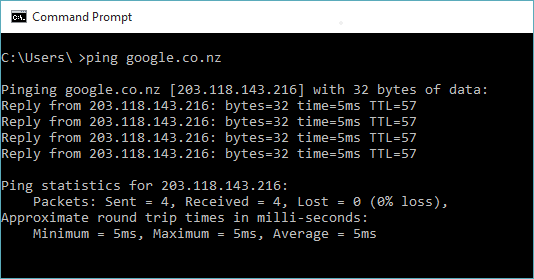
As web designers we are primarily concerned with two protocols within the TCP/IP family, HTTP(S) and FTP.

## How the Internet works

View an interactive demonstration: http://hwi.uni.be/hwi\_uk.html

## DNS

Short for Domain Name System (or Service or Server), DNS is an Internet service that translates domain names into IP addresses. While it is technically possible to use the internet without domain names, navigation would quickly become difficult. Because domain names are alphabetic, they're easier to remember. The Internet however, is really based on IP addresses. You are able to ping a domain name or IP address and see how quickly it replies. Pinging is sending a small amount of data/packets and receiving a response. If you ping a domain name, the computer will automatically request the IP address from the DNS. You should be able to see the IP address and the approximate round-trip time (shown below).



Exercise 1.0

Using your terminal, ping a variety of domains and note their IP addresses and approximate time.

Every time you enter a domain name into a browser, or send an email using a domain name, you are using DNS. The DNS system is like a shared database to which thousands of servers have access to.

A DNS maps a readable address, such as google.co.nz, to the correct IP address. We need the DNS to do this for us because computers and servers on the internet communicate using IP addresses. Every server and computer connected to the internet is assigned an IP address, sometimes this address is static, as in the case of most servers, and sometimes it changes, e.g. a home PC.

Exercise 1.1

Make a list of your five most used or favourite websites. Use the developer tools in your browser to record the total amount of HTTP responses of the home page of each web site, the total size (the combined size of all HTTP responses needed to download the page), and get each website's IP address.

## HTTP

HTTP is the protocol used to transfer web pages and other resources such as images, script files etc. over the internet (TCP/IP). When a browser requests a web page, an HTTP request is sent. This request can contain several bits of information. Below is an old request from a web browser to retrieve the Google home page:

GET / HTTP/1.1

Host: www.google.co.nz

Connection: keep-alive

User-Agent: Mozilla/5.0 (Windows; U; Windows NT 6.1; en-US) AppleWebKit/533.4 (KHTML, like Gecko) Chrome/5.0.375.70 Safari/533.4

Accept: application/xml,application/xhtml+xml,text/html;q=0.9,text/plain;q=0.8,image/png,\*/\*;q=0.5

Accept-Encoding: gzip, deflate, sdch

Accept-Language: en-US,en;q=0.8

Accept-Charset: ISO-8859-1,utf-8;q=0.7,\*;q=0.3

The above request sets the protocol and version being used, the host of the page being requested, the agent making the request (browser version) and other information to define what type of data is expected in return.

This request would result in the Google home page being returned in an HTTP Response. The response contains two parts. The first is a response header containing information about the returned page. The second part of the response will look very familiar, as it contains HTML. Below is the response header generated by the request above:

HTTP/1.1 200 OK

Date: Wed, 14 Jul 2010 04:56:47 GMT

Expires: -1

Cache-Control: private, max-age=0

Content-Type: text/html; charset=UTF-8

Server: gws

X-XSS-Protection: 1; mode=block

Content-Length: 14513

Connection: Keep-Alive

This process of generating an HTTP Request, and receiving an HTTP Response header and body is considered one HTTP Request when counting how many requests a web page requires to fully download. Each image and external resource such as JavaScript and CSS files will generate another HTTP Request to fetch the resource. One principle of good web design is to keep these requests to a minimum.

Exercise 1.2

Using the developer tools in your browser, generate requests for the following websites:

www.tvnz.co.nz

www.mighyape.co.nz

www.ird.govt.nz

For each web page, list the total HTTP requests needed to fully download the web page and the total bytes sent and received.

### HTTP status codes

The HTTP protocol will return a status code with each HTTP Response. Two common status codes are 200 and 404. 200 means that everything is ok and 404 means that the resource could not be found. Understanding these status codes can save time when debugging web pages and increase your understanding of how webpages work.

Exercise 1.3

What do you think are the most common HTTP status codes? Complete a web search and list what you think are the top 5. Add a short description for each.

# Browsing the web

There are now more web browsers and devices capable of viewing web pages than ever before. What device and browser a web page is viewed in can affect its functionality and design in many different ways, often with extreme consequences. For example, different browsers interpret CSS in different ways, and a lot of web capable devices do not support JavaScript not to mention the difference in screen resolution between devices.

A web page might be viewed on a mobile phone or a 50" TV Screen

It is important to develop websites for the correct audience by targeting the right browsers and devices. Most often you will target PC’s and the most common browsers today.

Exercise 1.4

Discuss with others and come up with a list of all the browsers and web capable devices that you use or know about. Think about screen size and features of each.

## Browser engines

A web browser engine (sometimes called layout engine or rendering engine) is a program that renders marked up content (such as HTML) and formatting information (such as CSS).

**WebKit** is the rendering engine in Apple's Safari.

**Blink** is the rendering engine for Google's Chrome and Opera.

**Gecko** is The Mozilla Project's open-source web browser engine that is used in Firefox web browser and the Thunderbird e-mail client.

**Trident**, the web browser engine from Internet Explorer, is used by many applications on the Microsoft Windows platform, such as Outlook Express, some versions of Microsoft Outlook, and the mini-browsers in Winamp and RealPlayer.

**EdgeHTML** is the proprietary layout engine developed for Microsoft Edge. It is a fork of Trident that has removed all legacy code of older versions of Internet Explorer.

[source: https://en.wikipedia.org/wiki/Web\_browser\_engine]

Exercise 1.5

Complete the paper folding exercise and explain why it relates to browsers and browser engines.

# Domains and hosting

Every website requires two things to be visible on the internet to the average user, a domain name and web hosting.

## Domain names

It is important to understand the rules, regulations and pricing structures involved with domain names so you can explain the process to a customer or employer. You will also have to work with domain names when making websites *live*.

Domain names can have many possible extensions such as .com, .co.nz and .org. Each domain extension is intended for a specific purpose, .com is used for global companies, .co.nz for New Zealand companies, .org for non-profit organizations and so on. As a web designer it is your responsibility to make sure that companies and organizations use the correct domain name extension.

Exercise 1.6

Create a list of as many domain name extensions as you know. Look up those extensions and list its intended use and cost in NZD per year if you can find it.

### Registering domain names

There are hundreds of companies that allow you to register domain names on the internet. All have different prices and options available when registering.

Some companies will offer free domain parking, which allows the domain name to be registered without being used. Others include domain names free with web hosting and so on.

All domain name registrars have something in common however, and that is the rules they must abide by when domains are registered and transferred.

### UDAI

When registering .co.nz domains the owner is issued with a UDAI number. This number gives control over the domains registrant details, in effect it is the password that allows a domain to change hands or be transferred.

The UDAI number should always be issued to the domains OWNER, not the host provider or technical manager. If a UDAI number is lost a new one can be issued to the email address of the owner. This email address can only be set or changed by the owner, so if the owner closes the email account used to register the domain, a UDAI can be lost. UDAI’s can be issued manually, but this can be complicated.

### .com

Registering a .com domain name is the same as any other domain name. Transferring a .com domain name requires that the domain be un-locked or released by the current web hosting. This frees up the domain for transfer. Sometimes a special authorization number is required. This number is similar to the UDAI number for .co.nz domains.

## Web hosting

All web pages require some form of hosting before they can be viewed by other internet users. Web hosting can be provided by a server on an intranet, a server with access to the internet or a home PC. Web hosting servers normally run one of two operating systems, Linux and Windows.

Both Linux and Windows are capable of serving simple HTML websites. The difference between the two is in the technology that they support. PHP and ASP.Net are two server side technologies that perform similar functions. PHP can run on both Linux and Windows, but is more commonly run on Linux to reduce costs. ASP.Net can only (at this stage) run on a Windows server.

When setting up web hosting for a new website there are a few points to consider. They are:

* Website space provided. How big can your website physically be?
* Website traffic or bandwidth. How many times can your website be downloaded? What traffic do you expect?
* Server technologies support. Do you need PHP, ASP.Net, databases or some other specific technology?
* Price.
* Support
* Does the web host allow you to setup and change emails for the website?
* Usability. Can you easily change website settings?

Exercise 1.7

Create a list of at least 3 web hosting companies in New Zealand. For each one, list the price, website space, traffic, technologies or features provided. Compare the price against an international hosting company and discuss differences.

## FTP

FTP (File Transfer Protocol) is commonly used by web developers to transfer files from a PC to Server or vice versa. It is designed to keep a connection open when transferring files, this allows for faster file transfers and better data management; this makes it ideal for transferring large files over the internet.

There are several FTP programs available for transferring files over the internet. The most popular program is FileZilla which also happens to be free. Some Integrated Development Environments (IDE’s) such as Microsoft Visual Studio include a fully featured FTP program to transfer websites when you are ready to upload. You can also use the functionality built into your operating system (via Explorer for Windows and Finder for MacOS). The instructions can be followed here: http://www.howtogeek.com/203432/how-to-access-ftp-and-webdav-sites-in-any-operating-systems-file-manager/

Websites are normally uploaded to the internet via FTP. This involves connecting to an FTP server. Connecting to an FTP server requires the following information:

* FTP server address
* User name
* Password
* Port (not always necessary)
* Starting folder (not always necessary)

When setting up a website with a web host, you will be provided with at least an ftp server name, user name and password to upload your website.

# Web development programs and technologies

Below is a list of common web development technologies, their uses and associated programs.

|  |  |  |
| --- | --- | --- |
| Technology | Usage | Associated programs |
| HTML | Defines elements on a web page for browser interpretation | Visual Studio, Expression Studio, Dreamweaver, any text editor |
| Haml | HTML preprocessor |  |
| CSS | Styles HTML elements | Visual Studio, Expression Studio, Dreamweaver, any text editor |
| Less | CSS preprocessor |  |
| Sass | CSS Preprocessor |  |
| XML | Common format for transferring and presenting data | Visual Studio, Expression Studio Dreamweaver, any text editor |
| JavaScript | A client-side scripting language used to add dynamic features to websites | Visual Studio, Dreamweaver, any text editor |
| Coffescript | Javascript preprocessor |  |
| jQuery | Javascript Library |  |
| PHP | An open-source server side framework used to create dynamic websites. | Dreamweaver, any text editor |
| ASP.Net | Active Server Pages with .Net. Used to create dynamic websites and applications. | Visual Studio |
| AJAX | A set of technologies (HTTP and JavaScript) that sends and receives data from web pages without refreshing pages. | Visual Studio, Dreamweaver, any text editor |
| C# | A programming language similar to C++ developed for use with .Net. | Visual Studio |
| MSSQL | Microsoft SQL Server. A database engine commonly used in .Net applications and websites. | SQL Server Management Studio/Express |
| MySQL | An open source database engine commonly used with PHP websites. | PhpMyAdmin |
|  |  |  |

# About web development

You will often hear the terms web designer and web developer used to describe a person who creates websites. Both of these terms are used vaguely and sometimes interchangeably to describe the same position. However, there is a slight different between the two.

A web designer is someone who deals more in the design side of websites. This includes graphics, usability design and style. They tend to use 3rd party applications, HTML, CSS and have a good knowledge of web design and hosting processes.

A web developer is someone who deals more in the functionality of websites; this includes programming, scripting and database integration.

There is also a third specialty which is graphic designer. Graphic designers can work in print, web, both or sometimes specialize. In this course you will learn the basics of graphic design for the web, however this is often a job on its own.

You may also come across the term “Full-stack developer”, and these are developers who are comfortable working with both back-end and front-end technologies.

### What’s involved?

There are several aspects involved in the creation of websites. These can include quoting, planning, designing, page creation, content writing and programming. In this course you will focus on design and programming. However, most topics will be covered, some in more detail than others.

Exercise 1.8

Brainstorm all aspects of web page creation. Once you have a list of aspects involved, divide them into topics a web designer should know, and what a web developer should know and topics a graphic designer should know.

Lastly, include any other professions which may be involved in the web site creation process. An example of this may be someone to market the website.

Homework

Think of a name you would like to use for your own website. Using a web hosting company or domain reseller, check to see if that domain is available for .co.nz or .com etc.

We will most probably use that name for your development projects.