

The Internet and Web Authoring

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Introduction

This book covers the requirements of FETAC Level 5 Modules for The Internet and for Web Authoring.

The support material on www.gillmacmillan.ie contains specific exercises for the Web Publishing section of the Internet Module C20168, which are also suitable for the Web Authoring Module C20148. You will need to type 'The Internet and Web Authoring' into the search tool on gillmacmillan.ie to access this material.

It is our hope that you will enjoy using this manual and the support material.

Both authors teach Computer Studies and the material in this book has been developed through a series of successful tutorials already given to students.

1

The History and Structure of the Internet

TOPICS IN THIS CHAPTER

- Historical Development of the Internet
- Development of the World Wide Web
- Structure of the Internet – Ownership, Administration and Funding
- Assessment of the Internet as a New Communications Medium

Historical Development of the Internet

The Internet is the global network of interconnected computers. It is defined by its own set of unique rules or protocols, particularly the TCP/IP suite of protocols, and particularly by the fact that it is a packet switched network.

Emergence of the Internet

The idea of a global network was introduced by J. C. K. Licklider of MIT (Massachusetts Institute of Technology) in August 1962. He envisaged a situation where interconnected networked computers could talk to each other globally, and share programs and information with each other.¹

ARPANET Project

The ARPANET (Advanced Research Projects Agency Network) was developed by the IPTO (Information Processing Techniques Office) under the sponsorship of DARPA (the Defence Advanced Research Projects Agency). Its motivation was prompted, among other things, by the launch of Sputnik 1 by the Soviet Union in 1957.

The ARPANET's project objective was to develop a network communications technology where computers and networks could connect and talk to each other, share data and have the capacity to function even if one of the networks was damaged.

In 1963 a universal standard code was developed which allowed machines 'from different manufacturers to exchange data'.² This was known as the ASCII (American Standard Code for Information Interchange) code.

With ARPA funding, the first long-distance network connection occurred in 1965, when Larry Roberts and Thomas Marill connected the TX-2 computer at MIT's Lincoln Laboratory in Massachusetts to the Q-32 computer in Santa Monica, California.³ It became apparent that using the existing telephone system for transmitting information was too slow. The necessity of packet switching was suggested by Leonard Kleinrock at MIT.

Packet switching can be explained by comparing it with the existing telephone system, widely known now as the Plain Old Telephone Service (POTS). Here, for a conversation to take place, a continuous connection has to be made between the two parties, whether this is a voice conversation or two modems sending and receiving data. In comparison, a packet switched network transmits packets of data. These packets can follow different routes. The computer receiving the packets is able to reassemble the stream of data and ask for re-transmission of damaged or missing data. The ARPANET became the first network to use packet switching. The first connection between two computers on the ARPANET occurred in the autumn of 1969.

At this time, the ARPANET was still a very small network limited to the academic, medical and industrial/military sectors. Nevertheless, important developments were made: in particular, the concept that packet switched networks worked was proved. The Network Control and File Transfer Protocols (NCP and FTP) were developed.

Timeline

- 1971 – Intel developed the first microchip, the necessary precursor to all the electronic gadgetry we find indispensable today.
- 1972 – Ray Tomlinson wrote a program to allow transmission of electronic mail over the ARPANET. He initiated the now familiar 'name@host' form of e-mail address.
- Mid-1970s – hobbyists began building their own computers from kits. This small but enthusiastic band of amateurs eventually began to avail of some aspects of the ARPANET which allowed them to play games against people in other cities and to connect to bulletin boards.
- 1977 – Apple began selling its Apple II home computer.
- 1979 – Usenet was introduced. It still exists and is a separate part of the Internet. It is a distributed system: that is, its postings are interchanged between hosts on a regular basis. It features threaded discussion groups to which anyone one can subscribe.
- 1981 – IBM launched their personal computer, the predecessor of all today's PCs.
- 1985 – Windows 1.0 operating system arrived on the scene. It included a small number of desktop applications, including a notepad, a clock, a calculator and a calendar.

- 1990 – Windows 3.0 was introduced. It had better icons, a file manager, a print manager, and a program manager. It was the first successful commercial version of Windows.
- 1993 – Windows NT (New Technology) was introduced: it had a full 32-bit operating system and dropped the link with DOS.
- 1995 – Microsoft released the first cross-platform browser (Internet Explorer 2.0).
- 1996 – Windows NT was upgraded to Windows NT 4.0.
- 1998 – Windows 98 was released. Since then Microsoft have brought out a number of new versions of Windows, the latest being Windows 7, released in 2009.

Development of the TCP/IP Protocols

The Internet is a man-made construct and functions with high reliability because of the underlying rules, or protocols, to which every computer accessing the Web must conform. It is not the purpose of this book to study these rules but mention is made of two of the most important, namely TCP and IP.

Although the Network Control Protocol (NCP) allowed host computers to talk to each other within a network, it was realised that the NCP was very limited in what it could do. The solution was the development of the crucial Transmission Control Protocol/Internet Protocol (TCP/IP) protocol suite.

These protocols are the rules governing how computers connect and communicate with each other on the Internet. The co-designers of the TCP/IP Protocol were Vinton Cerf and Robert Kahn.

‘In December of 1974, Dr Vinton Cerf, with Stanford graduate students Yogen Dalal and Carl Sunshine, published the first technical specification of TCP/IP as an Internet Experiment Note RFC (refer for comment) 675.’⁴ RFC 675 is available for viewing at the following web address: <http://www.tools.ietf.org/html/rfc675>. Interestingly, their design included a 32-bit IP address. Dr Kahn had considered the possibility of having networks communicating with each other independent of ‘individual hardware and software configuration’.⁵ So, he set four goals for what would become the Transmission Control Protocol:

- **Network connectivity.** Any network could connect to another network through a gateway.
- **Distribution.** There would be no central network administration or control.
- **Error recovery.** Lost packets would be retransmitted.
- **Black box design.** No internal changes would have to be made to a computer to connect it to the network.⁶

Later, the 'Transmission Control Protocol design was layered into two protocols' – TCP/IP. TCP/IP is the primary protocol that governs the Internet.

- The TCP manages the disassembling and reassembling of data packets, which are then brought back to their original data format. It is also responsible for the retransmission of lost packets. TCP communicates with the host application on one computer and the host application on another computer on a network or networks. (Definition of TCP from SearchNetworking.com http://searchnetworking/techtarget.com/sDefinition/0,,sid7_gci214173,00.html.)
- Internet Protocol (IP) is the protocol that is responsible for the address component of data packets, which are sent from one computer to another computer over a network or networks.

The TCP/IP protocol was formally adopted as the standard for the ARPANET in 1983. A computer on one network wanting to connect with a computer on the ARPANET had to use this protocol.

The EUNET (European Network) connected to the ARPANET in 1989. Ireland was linked to the Internet backbone in 1990.

In 1980, the National Science Foundation (NSF) 'funded the development of CSNET [Computer Science Network], to link computer science departments in America not connected to the Arpanet'.⁸ Subsequently, NSFNET was established, and in 1991 the NSFNET backbone was upgraded to T3, or 45 Mbps.

Also in 1991 NSF had changed its AUP (acceptable use policy): this meant that the Internet was no longer restricted to the research community, computer developers and the academic world – it had now become accessible to anyone, providing they had a computer and an Internet connection.

In 1990, the ARPANET was retired, and a number of university computers connected to the ARPANET now moved to the NSFNET.⁹ Some of the services offered by the ARPANET had included mail, file transfer and remote log on Telnet.

Throughout the 1980s private companies and government agencies had set up their own networks, for example CompuServe and AOL. Networks now began to interconnect and the scene was set for the rapid expansion of the Internet.

Development of the World Wide Web

The World Wide Web (WWW) is possibly the foremost contributing factor responsible for the explosion of the Internet. As mentioned above, the Internet is a network of networked computers.

The Web links together pages, data and resources which are held on Web servers all over the world. You navigate around the Web by entering a Web address – the address of a particular website, known as a URL (Uniform Resource Locator) – in your browser window. Your browser will then locate the website and you can navigate from one page to another by clicking on the hyperlinks. A browser, which is a client application, receives, interprets and displays web pages.

How it All Began

The World Wide Web was introduced by Tim Berners-Lee. His story of how the Web evolved is told in his publication, *Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by its Inventor*.

While working at CERN (Organisation Européenne pour la Recherche Nucléaire), in Geneva, Switzerland, Tim Berners-Lee had been considering how he might link research documents across computers. He wanted to share research findings and he wanted this sharing to be interactive.

In 1989 he produced *Information Management: A Proposal* (Tim Berners-Lee, CERN, March 1989.¹⁰ This document is available to view at <http://www.w3.org/History>.) Here he introduced the idea of a protocol that could transmit and link documents across operating systems and across the Internet. This is known as the HTTP (HyperText Transfer Protocol).

- **HTTP** sits on top of the TCP/IP protocol, which is used to connect to Web servers. HTTP is a request/response system: it delivers to your browser web pages that have been requested.
- **HyperText** was a concept already in existence: it had been mentioned by Vannevar Bush in 1945 – before computers were invented – and by Ted Nelson and Doug Engelbart in 1960. Hypertext allows you to jump from link to link in a non-linear way.
- **HTML** (HyperText Markup Language) was developed to write web pages so that computers with different operating systems could communicate with each other.

First Web Server

Tim Berners-Lee used a NeXT computer as a Web server. It was the first Web server, hypermedia browser and Web editor.

First Website

The first website was put on line on 6 August 1991. The first Web surfer was Robert Cailliau, a Belgian computer scientist who had collaborated with Tim Berners-Lee

on the World Wide Web project.¹¹ In April 1993 CERN announced that the World Wide Web would be free to everyone.



It is worth noting that Tim Berners-Lee, who invented the 'Web', has consistently refused to sell it – he wants it to be an open forum and not in the ownership of any particular organisation or nation. He had vision and he knew that the WWW needed control and organisation.

It was for this reason that in 1994 he established a consortium, known as the World Wide Web Consortium (or W3C), membership of which is open to educational bodies, organisations, and commercial and government entities. Tim Berners-Lee states that 'W3C members work together to design Web technologies that build upon its universality, giving the world the power to enhance communication and commerce for anyone, anywhere, anytime and using any device.' Membership details are available at <http://www.w3.org/Consortium/membership>. Membership is not open to private individuals.

In 1993, Marc Andreessen and his team (which included Eric Bina) at the National Center for Super Computing at the University of Illinois developed a graphic interface browser which was named 'Mosaic'. Mosaic was easy to use, and allowed images to be displayed in line with text within pages – until then you had to link an image which had to be displayed on a different page. The design also included additional HTML tags.

Some of the major browsers available today include:

- Microsoft Internet Explorer
- Google Chrome
- Mozilla Firefox
- Apple Safari
- Opera.

It is reported that, of the world population of 6.8 billion, 1.73 billion people are Internet users: that's approximately 26% of the global population.

Structure of the Internet – Ownership, Administration and Funding

As with everything related to computers, the Internet has a physical/hardware element and a software/rules element. The hardware element stretches from the client PC in the home or office through the cabling and other infrastructure taking signals to an ISP and thence to the Internet backbone and ultimately to the server providing the web page or to another ISP for receipt of an e-mail message.

Private individuals connect to the Internet through their Internet Service Provider (ISP). Their ISP in turn connects with other higher-level networks. These networks use trunk routes which are usually owned by governments or commercial organisations. They carry data across oceans and continents.

The trunk routes are the backbone of the Internet. They offer high speed, and they may use fibre optic cabling. These networks are connected at Internet Exchange Points (IXPs).¹²

Ownership

No one actually owns the Internet. It is not under the control of any one government or organisation. The elements of its physical infrastructure – networks, cables, routers, etc. – are owned by organisations: government bodies, ISPs and commercial institutions.

Administration

How does the Internet function if no one government or organisation actually owns it? It is organised by consensus, with the co-operation of international bodies who work together under the mantle of the Internet Society (ISOC), whose board of trustees are concerned about the Internet and its impact on society. ISOC is a non-profit-making organisation with offices in Washington and Geneva and chapters all over the world. There are over 80 organisations involved. Some of the most relevant bodies in terms of influence and power are listed on the following page.

ISOC's mission statement is: 'To assure the open development, evolution and use of the Internet for the benefit of all people throughout the world.' It 'facilitates open development of standards, protocols, administration and the technical infrastructure of the Internet'.¹³

The society was founded in 1992 and was awarded the right to manage the .org domain in 2002. Membership is open to any individual.

Some of the groups associated with ISOC are:

- **Internet Architecture Board (IAB)** – 'The IAB is chartered both as a committee of the Internet Engineering Task Force [IETF] and as an advisory body of the Internet Society.'¹⁴ IAB offers guidance and advice to the ISOC on the architectural procedures and the technologies used on the Internet. It is responsible for the editorial management and publication of the Request for Comments (RFC) document series.
- **Internet Engineering Task Force (IETF)**. The goal of the IETF is to make the Internet work better. In its mission statement it says that it aims to 'make the Internet work better by producing high quality, relevant technical documents that influence the way people design, use, and manage the Internet'.
- **Internet Research Task Force (IRTF)**. Its mission is: 'To promote research of importance to the evolution of the future Internet by creating focused, long-term and small Research Groups working on topics related to Internet protocols, applications, architecture and technology.'¹⁵
- **Internet Assigned Numbers Authority (IANA)**: responsible for the global co-ordination of the DNS Root, IP addressing, and other Internet protocol resources.¹⁶

Funding

ISOC receives funding from the following sources:

- organisation members' contributions (including platinum sponsorships)
- individual member dues and donations
- sponsorships for ISOC events
- contribution of excess net assets from the Public Interest Registry.¹⁷

Assessment of the Internet as a New Communications Medium

The Internet was originally conceived as a means of sharing knowledge, research papers and information. As it evolved it became obvious that an overall organisational structure was required.

As we are already aware, the Internet had by 1996 moved beyond the realms of academia, and millions and millions of people were surfing the Web. Desktop

computers, which were known as personal computers (PCs), had become available and affordable. Organisations such as IBM and Microsoft had designed applications that were 'user friendly'. The Netscape browser had gone public and Microsoft had introduced Internet Explorer and had bundled it with its Windows operating system. Today newspapers are available online; music, books and videos can be downloaded and viewed on desktop or laptop computers. Radio stations are streamed.

The Internet Society was established to oversee the development of the Internet in a structured manner. Concepts such as ethics, intellectual property, privacy and content had to be addressed. Some of these issues had already been debated with the invention of earlier technologies, for example telegrams, telephone, newspapers, films, radio and television. But here lies the difference: information is now available globally in real time. Reaction to world events can be swift. Security issues have to be considered and implemented.

Undoubtedly, the Internet has changed communication: there is openness, and individuals have access to the latest news, ideas, research and scientific findings and, more important, have the power and willingness to publish their views and opinions on the Web. But this new freedom of expression can also be used to turn communities against each other.

Communications

Personal

Today you can communicate with your friends in real time using Internet technologies such as:

- Instant Messaging (IM), which consists of sending instant text messages from one computer to another.
- Blogs (Web journals), which you can use to express your views.
- Twitter – to post a tweet to your Twitter account (you will then have tweeted). The maximum number of characters per 'tweet' (message) is 140 characters.
- E-mail (electronic mail) messages – faster and cheaper than using the normal postal system.
- Voice over Internet Protocol (VoIP), a technology that allows you to make computer-to-computer calls, for example Skype and Google Talk.
- Social networking sites, which are among the most popular sites on the Internet, for example:
 - Facebook
 - Bebo
 - YouTube (used to share and view videos)
 - Flickr (used to share photographs and videos).

Professional Training and Development

Use of the Internet as a resource for personal and professional training and development has become part of today's world. University students are expected to be familiar with the Internet and to be able to send and receive e-mails and to access publications online.

A number of institutions offer courses which are delivered entirely online, for example:

- National University of Ireland in Galway – an online course on Irish Studies
- Trinity College Dublin – an iTunes U portal where podcasts and videos/movies can be downloaded
- a number of leading American universities (Berkeley, MIT, Stanford and Yale) have opened some of their courses and lectures to the public. These lectures can, of course, be downloaded to your computer or to an iPod.

Research

Content on the Internet is variable. As we have already noted, at one level the information can be surprisingly good – scientific papers, articles and books. (Google has already scanned over 10 million books from major American and European libraries, which makes it the largest library in the world.) You can download literary masterpieces through the Gutenberg Project.¹⁸ At a more remote level, content may not be entirely accurate, and may be difficult to trace – there are no borders on the Internet.

When using the Internet as a research resource you should:

- analyse and critically appraise the material available
- check the origin of the source material
- beware of any bias that may be apparent – look out for propaganda
- beware of ethical issues, for example plagiarism
- check for copyright. Copyright restrictions apply on the Internet. Always ask permission when using other people's work or images. It is permissible to reproduce a small part of a work, where it is pertinent¹⁹
- know how to use search engines effectively.

Commercial, Public Relations and Marketing

The Internet is used to transact business in many areas, for example:

- online banking
- PayPal – which makes it safe and easy for individuals to buy or sell goods on the Internet
- e-mail
- advertising

- online shopping
- digital content, for example journals, newspapers, audio books, MP3 tracks.

The power of the Internet as a resource in the commercial, public relations and marketing fields was evidenced in the American presidential election of 2008, when the Democratic candidate Barack Obama was elected as the 44th President of the United States. His campaign utilised the Internet effectively; supporters collected funds using databases, sent e-mails and reached out to Middle America. They also used Twitter and Facebook to get his message across. His campaign was widely admired for its effectiveness. President Barack Obama has his own website, and he still uses the Internet to deliver weekly addresses from the White House.²⁰

It is now apparent that the effective use of modern Internet technologies, exceptional personal communication skills and leadership can all combine together to produce effective results.

As we have seen, the Internet is redefining our world. As to how we manage cyberspace – that is for us and the future to decide.

EXERCISE

Briefly answer the following questions.

- Define the term 'Internet'.
- What does the acronym ARPANET stand for?
- Who is known as the 'father of the Internet'?
- What is the IP protocol responsible for?
- What is the TCP protocol responsible for?
- Define the World Wide Web.
- What is a browser?
- What does the acronym HTTP stand for?
- What does the acronym HTML stand for?
- Name the person who is accredited with the introduction of the World Wide Web.
- CERN announced the World Wide Web would be free to all on what date?
- Who owns the Internet?
- Why was the ISCO established?
- Name two ways of communicating on the Web.
- Is copyright law applicable to the Internet?
- Name some of the factors that are important when using the Internet as a research tool.
- Name two institutions that provide online training.

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