

## Unit 391 The Technology of the internet Level 3

**Credit value 9**

### Rationale

The aim of this unit is to enable candidates to understand the principles and the technologies that allow the internet to function and how different types of communications take place. The candidate will also learn about securing communications and will develop the skills required to understand how to create, support and maintain the environment that enables the internet in Windows systems.

There are 5 outcomes to this unit. The candidate will:

1. be able to explain the concepts behind the internet, its history and purpose
2. know the technologies that allow communication across the internet
3. be able to explain the technologies behind the World Wide Web and how to make information available
4. understand the additional services available on the internet, their function and use
5. know the security implications of making information available on the internet

### Guided learning hours

The recommended guided learning hours for this unit are 60 hours.

### Connections with other awards

NVQ links	Outcome	This award contributes to the knowledge and understanding of the following Areas of Occupational Competence for the City & Guilds NVQ for IT Professionals (4324)
322		Internet and intranets 3
127		Web site software 1

### Key Skills links

Communication	C1.3
Application of Number	N1.1
Information technology	None
Working with others	None
Improving own learning	LP2.1, LP2.2, LP2.3
Problem solving	PS2.1, PS2.2, PS2.3

### Assessment

Assessment will be by means of a set assignment covering practical activities and underpinning knowledge.

## **Outcome 1: Be able to explain the concepts behind the internet, its history and purpose**

### **Practical activities**

The candidate will be able to

- Use an RFC search engine
- Interpret internet related Requests for Comments
- search the world wide web (www) using different types of search engine
- search the internet using specialist search engines for locating: news archives, FTP servers, media files, usenet
- optimise an internet search

### **Underpinning Knowledge**

The candidate will be able to

1. describe the history of the internet
2. explain internet terminology
  - a. browser
  - b. server
  - c. HyperText Transfer Protocol (HTTP)
  - d. HyperText Markup Language (HTML)
3. explain the basics of internet communication
  - a. common language
  - b. Internet Protocol Suite
  - c. addressing system
  - d. simple and open specifications
  - e. Client/server model
4. explain the need for standards and the purpose of a Request for Comment (RFC)
5. explain the nature of the World Wide Web
  - a. HyperText
  - b. HyperText/Hypermedia systems
6. explain the purpose and use of an intranet
  - a. extensibility
  - b. low cost
  - c. reuse of existing systems
  - d. Universal Client
7. explain the purpose and use of an extranet
8. identify different types of web browser
  - a. multiple platform
  - b. GUI
  - c. non-desktop
  - d. other
9. describe browser capabilities and settings
10. explain the use of web server software
  - a. UNIX-based

- b. NT-based
- 11. describe methods that can be used to find information on the internet
  - a. search engines
  - b. directories
  - c. hybrids
  - d. metacrawlers
- 12. explain the different types of search engine
  - a. robot based
  - b. directory based
  - c. human moderated catalogues

## **Outcome 2: Know the technologies that allow communication across the internet**

### **Practical activities**

The candidate will be able to

1. use Transmission Control Protocol/Internet Protocol TCP/IP diagnostic utilities
2. run a command prompt
3. use the IPCONFIG diagnostic tool to investigate
  - a. IP address
  - b. subnet mask
  - c. default gateway
4. use the /all switch of IPCONFIG to find out additional network information
5. use the network utility PING to
  - a. test IP connections to local machines
  - b. contact remote systems
  - c. test DNS connections
6. look at a routing table and understand the results
  - a. use the NETSTAT -nr command for additional details
7. analyse the results of using the TRACERT utility with IP results to route to another address
  - a. locally
  - b. remotely
8. use TRACERT to test a route to one of the global name servers
9. compare the results of TRACERT tests and understand the significance of the information
10. install a graphical application for displaying route information
  - a. test several routes and understand the results
11. use the command prompt to look at
  - a. well known ports on the server
  - b. use of ports on the client
12. analyse the setup of a DNS client
13. demonstrate how to set a DNS connection to a domain name server
14. analyse the results of using the TRACERT utility with domain name results to route to another address
  - a. locally
  - b. remotely
15. use the NSLOOKUP utility to obtain information from IP addresses and domain names
  - a. name servers names

- b. name servers IP addresses
  - c. Start Of Authority
  - d. Aliases
  - e. Mail Exchangers
16. use the NSLOOKUP utility to do a reverse lookup
  17. evaluate some web based services providing 'whois' lookups
  18. evaluate a web based facility for investigating download times with
    - a. different file sizes
    - b. different connectivities (speeds)
  19. formulate solutions for connectivity strategies in different scenarios taking into account
    - a. bandwidth requirements
    - b. types of connection
    - c. purpose
    - d. size of company
    - e. security

### **Underpinning Knowledge**

The candidate will be able to

1. explain the Transmission Control Protocol/Internet Protocol (TCP/IP) as the basic communication language or protocol of the internet.
2. describe the TCP/IP Protocol Stack and how the protocols fit together
3. compare the OSI 7-Layer Model with the 4-Layer USA Department Of Defence DOD Model
4. contrast the user's view of Internetworking with the reality
5. describe IP (Internet Protocol)
  - a. packet-forwarding
  - b. connectionless
  - c. "Dotted decimal" notation
6. explain the different address classes
7. explain internet addresses - IPv4, IPv6 (IPng)
8. explain the purpose of the subnet mask
9. describe how networks are connected
10. explain the use of the transport protocols (TCP and User Datagram Protocol (UDP))
11. explain the use of ports
  - a. the way that applications talk to TCP/IP
  - b. source IP Address and Port Number
  - c. destination IP Address and Port Number
12. describe IP Address to Name Resolution
13. explain the uses of the Hosts file and its implications
14. explain DNS (Domain Name System) concepts
15. describe how to configure Name Service on a Client
16. explain the process of domain and address registration
17. explain internet connectivity strategies
  - a. Modem transmission
  - b. Mobile internet access
  - c. Wireless internet access protocols
  - d. Integrated Services Digital Network (ISDN)
  - e. Digital Subscriber Line (DSL)

- f. Digital Leased Line
  - g. LAN connectivity
18. describe the purpose of a Virtual Private Network (VPN)
  19. explain the services offered by Internet Service Providers (ISP's)
  20. explain the purpose of Dynamic Host Configuration Protocol (DHCP)

**Outcome 3: Be able to explain the technologies behind the World Wide Web and how to make information available**

**Practical activities**

The candidate will be able to

1. use a text editor eg Notepad to create a HTML page
2. save a file in the root folder structure of a web server
3. use a web browser to access a HTML page with a HTTP connection
4. start a non-graphical browser eg Telnet
5. simulate the interactions between a browser and server using a non graphical browser
6. create a connection to the web server using the correct port
7. request an HTML page from the web server using Telnet
8. analyse the header response from the web server
  - a. HTTP version
  - b. web server software
  - c. Content-Type
  - d. Content-Length
9. analyse the response data from the web server
10. request a different type of resource from the web server
11. compare the settings of different browsers
12. analyse the results of changing browser settings in relation to
  - a. graphics and images
  - b. scripting and programming
13. show the effects of adding plug-ins to a browser
14. evaluate the issues relating to non-desktop browsing environments
15. use an HTML editor to
  - a. create a web site structure within a web server
  - b. construct a Home page
  - c. create web content
  - d. check the appearance and functionality of a web page in multiple browsers
  - e. modify a web page by adding additional text and HTML tags
  - f. construct linked HTML pages using hyperlinks
  - g. use other resources such as graphics

**Underpinning Knowledge**

The candidate will be able to

1. explain that the World Wide Web is a worldwide network of information servers linked by the internet
2. recognise which common features enable communication

- a. HyperText Markup Language (HTML)
  - b. Resource Naming Scheme
  - c. Resource Retrieval Language
3. explain how hyperlinks work
4. identify the components of Uniform Resource Locators (URLs)
  - a. How - the protocol to use
  - b. Where - the host to contact
  - c. What - the resource to retrieve
5. describe the syntax of different URL schemes
6. describe the syntax of the HTTP URL format
7. describe the purpose and limitations of the HyperText Transfer Protocol (HTTP)
8. explain the interactions created by HTTP requests and responses
9. recognise the different elements of a communication between the browser and a server
10. explain the importance of the cache (eg Temporary internet files)
11. describe the number and type of web browsers available
  - a. multiple platform
  - b. desktop
  - c. WebTV
  - d. WAP
  - e. mobile
12. explain that a browser has many functions and gateways
13. describe how a browser may display pages which contain browser dependent code
14. describe the capabilities of some of the current desktop web browsers
15. describe the capabilities of some of the current non-graphical web browsers
  - a. text-only Browsers
  - b. LYNX and similar programs
  - c. Telnet browsers
  - d. microbrowsers
  - e. WAP-enabled devices
16. explain the other technologies that a browser may be able to interpret
17. describe the structure of a web page
18. define HyperText Markup Language and its versions
19. explain the different types of HTML editing tools
  - a. ASCII text editors
  - b. WYSIWYG editors and tools
  - c. Downloadable tools and utilities
20. explain the principles of an HTML Page and its structure
21. explain the purpose and use of HTML tags
22. describe the HTML tags and attributes for hyperlinks, anchors, images, text, colour and tables
23. describe the use of multimedia and graphics in web pages

**Outcome 4: Understand the additional services available on the internet, their function and use**

### **Practical activities**

The candidate will be able to

1. identify and locate a relevant news server

2. install and use a newsreader application
3. configure the newsreader application to attach to a news server
4. specify the requirements for the creation of a news server account
  - a. user name
  - b. password
  - c. news server address
  - d. logon elements
5. modify account information and attach to a public news server
6. extract newsgroup messages
7. use a newsgroup reading facility with a web front end
8. locate public file repositories
9. use the browser to download a file with FTP
10. explore different options for finding FTP servers
11. install and use a graphical FTP application
12. select different predefined FTP servers and analyse their files
13. use Telnet to connect to a mail server using Simple Mail Transfer Protocol (SMTP)
14. create an email message by manually typing the required SMTP commands and send the message
15. use Telnet to connect to a mail server using Post Office Protocol (POP)
16. issue the commands necessary to retrieve an email message from a specified account
17. identify different web based email applications
18. analyse the results of an auto responder by sending an email to an automated system

### **Underpinning Knowledge**

The candidate will be able to

1. explain browser functions and gateways
2. explain the use of Usenet
  - a. Worldwide discussion groups
  - b. Threaded messaging
  - c. Newsgroup hierarchies
3. describe how to connect to Newsfeeds
  - a. how to join Usenet
  - b. which groups to take
  - c. no "master" site
4. describe the differences between a dedicated newsreader and a web based newsreader
5. explain newsgroup names and categories
6. describe the method for propagation of messages
7. explain the transport protocols used for Newsgroups
8. describe some of the web sites specifically offering file downloads using FTP
9. describe the purpose of File Transfer Protocol (FTP)
10. describe FTP commands
11. explain the use of anonymous FTP and the requirements for access to anonymous FTP servers
12. describe different types of FTP software
13. explain the concepts of Peer to Peer networking
  - a. peer to peer networking programs

- b. capabilities
  - c. initiating a communication session
  - d. shared resources
  - e. protocols
14. describe the use of a Telnet session and its capabilities
  15. explain the difference between
    - a. local addressing
    - b. location-independent addressing
  16. explain message formats
    - a. Common, basic message format
    - b. Text-based (no graphics)
  17. describe the principles of binary data transmission
    - a. RFC822 messages
    - b. UUencode/UUdecode
  18. describe the purpose and use of Multipurpose Internet Mail Extensions (MIME )
  19. explain the different elements of mail transfer
    - a. User Agent (UA)
    - b. Message Transfer Agent (MTA)
    - c. Relay Agent (or Host)
    - d. Delivery Agent
  20. explain the connection between mail routing and the Domain Name System (DNS)
  21. recognise the significance of MX Records for "Mail eXchangers"
  22. describe the uses of the Simple Mail Transfer Protocol (SMTP)
  23. explain the ASCII-command syntax for a SMTP communication
  24. describe the use of POP and explain the ASCII-command syntax for a POP communication
  25. describe other mail protocols
    - a. Internet Message Access Protocol (IMAP)4
    - b. X.400
  26. describe the elements required for a mail network and the functions required
  27. describe the main mail applications
  28. describe the elements of mobile email access
    - a. web based email
    - b. email roaming
  29. explain email issues such as
    - a. spam
    - b. viruses

**Outcome 5: Understand the security implications of making information available on the internet**

**Practical activities**

The candidate will be able to

1. install and configure a software Firewall application
2. analyse the responses to application requests
3. make decisions concerning the acceptability of application requests
4. appraise the applications' response to different types of internet communications
  - browsing
  - Ping

- TRACERT
  - email
  - newsgroups
5. issue ICMP requests and demonstrate how to block relevant packets
  6. create a trust relationship
  7. produce a diagram showing the structure of a secure communication

## **Underpinning Knowledge**

The candidate will be able to

1. explain the need to maintain secure communications when connecting to the internet
2. explain the requirements of a security policy
3. explain the purpose of a Firewall
4. describe different types of Firewall structures
  - a. individually secured devices
  - b. Dual Homed Gateway
  - c. application Proxy Server
  - d. Firewall Model
  - e. Packet Filtering
  - f. Packet Capture
5. describe possible security threats
  - a. viruses
  - b. trojans
  - c. trap doors
  - d. logic bombs
6. explain the role of other protocols such as Internet Control Message Protocol (ICMP) in message communication
7. explain what is required in order to secure a communication
  - a. authentication
  - b. encryption
8. explain the elements required and processes involved in Private Key Algorithms (Symmetric)
9. describe the key distribution and management issues of Private Key encryption
10. explain the elements required and processes involved in Public Key Algorithms (Asymmetric)
11. explain the advantages and disadvantages of Public Key Algorithms as compared to Private Key encryption
  - a. key management
  - b. slow performance
  - c. key sizes
  - d. vulnerability
12. define the elements involved in authentication of a message
13. explain the different Hashing algorithms and their use
14. describe the purpose and use of a Digital Signature
15. explain the components of a Digital Certificate
16. explain what is involved in breaking Public Key cryptography
  - a. deception / bribery / etc
  - b. "brute force"

17. explain how the credentials of a Certificate can be checked
18. describe the elements of the Secure Sockets Layer (SSL) and HyperText Transport Protocol Secure (HTTPS)