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TQF: Internet protocols
Online course specification

Target audience:
This course is designed for technicians and engineers involved in the design, commissioning and maintenance of networks that use the Internet suite of protocols. It is suggested that this course is studied with PTT's "IP networks" course.

Course aim:
This online course explains the role, facilities and operation of the various protocols employed on the Internet and many other communications systems. The threats to, and protection of, such networks are referred to throughout this course. The topology and administration of the Internet is also described.

Course level: Intermediate
An explanation of PTT course levels is given at the end of this document

Pre-requisites:
An understanding of the basic principles of packet switching. It is recommended that the PTT e-learning course "Data communication principles" is studied before attempting this "Internet protocols" course.

Course structure:
The course consists of the following four modules:
1. Introducing the Internet
2. The Internet Protocol
3. Transport protocols
4. Other Internet protocols

Module 1: Introducing the Internet

Module aim: To describe the basic structure of the Internet, the role of the various Internet administrative bodies and the role of Internet service providers.

After completing this module, a trainee will be able to:

- explain how its mode of operation and choice of protocols employed in the Internet has driven its success.
- describe the basic topology of the Internet with reference to Points of Presence (POP), Internet eXchange Points (IXP) and the types of network that make up the Internet.
- describe the role of the various Internet administrative bodies including ISOC, IETF, ICANN and regional Internet registries (RIR).
- describe and compare the roles of Tier 1, Tier 2, and Tier 3 Internet Service Providers (ISPs).
- describe and compare the use of ISP transit services and peering arrangements.
- describe the facilities offered by ISPs to its customers inc. Internet access, web hosting and email services.
- explain that the Internet is inherently insecure giving examples of how the security of information sent over or stored on the Internet can be compromised.

- describe the importance of encryption, digital certificates and ant-virus software in protecting data against unauthorised access.

Module 2: Internet Protocol

Module aim: To describe the role, operation and facilities offered by the Internet Protocol (IP).

After completing this module, a trainee will be able to:

- describe the structure and role of an Internet Protocol (IP) packet.
- indicate the relationship of IP to the OSI Reference Model.
- explain the concept and advantages of connectionless operation.
- compare the format and facilities of version 4 (IPv4) and version 6 (IPv6) of the IP addressing schemes.
- describe the function of the various IPv4 and IPv6 packet header fields inc the address fields and the Type of Service field (IPv4) and Class field (IPv6).
- explain the main benefits of IP-based Next Generation Networks in the provision of telecommunications services.

Module 3: Transport protocols

Module aim: To describe the role and operation of the Transmission Control and User Datagram protocols.

After completing this module, a trainee will be able to:

- describe the role of the Transmission Control Protocol (TCP).
- describe the process of setting up a TCP connection.
- explain the purpose and operation of TCP flow control with reference to the role of sequence and acknowledgement numbers.
- explain the factors that determine how an initial sequence number for a TCP connection is generated with reference to security and reliability.
- explain that the User Datagram Protocol (UDP) may be used instead of TCP where excessive delay cannot be tolerated.

Module 4: Other Internet protocols

Module aim: To describe the role of protocols that have widespread use on the Internet.

After completing this module, a trainee will be able to:

- describe the role and basic operation of various application layer protocols including FTP, HTTP and SMTP with reference to file transfer, web browsing and emailing respectively.
- explain that FTP uses separate TCP connections for control purposes and file transfer.
- explain how firewalls may affect the setting up of a file transfer session.
- describe how applications such as file transfer, sending emails and filling in web page forms can be made more secure.
- describe the role and operation of the Internet Group Management Protocol (IGMP) with reference to multicasting.
- describe the purpose of a route discovery protocol.

Course access requirements:
To access the course, a computer running a browser such as Google Chrome, Safari etc is required. The computer should have Internet access. A screen resolution of at least 1024x768 is necessary.

Learning facilities:
This online course employs interactive simulations, hypertext links to an online glossary and multiple-choice question sessions to fully involve the trainee in the learning experience. Each module provides revision links to previously studied, relevant topics. A record of progress and level of achievement is recorded for each trainee. Once studied as a structured, assessed course, the content can be browsed for revision or reference.

PTT course levels:
PTT online courses are categorised by one of three levels according to the depth of treatment they provide:

1. **Introductory:**

   PTT Introductory courses are designed for those with no previous experience or knowledge of telecommunications. These courses provide an overview of telecommunications or discuss the fundamentals of electronic communications. The study of general science at secondary (high) school is a typical pre-requisite for PTT Introductory courses.
   PTT Introductory courses are suitable for those joining the telecommunications sector particularly those in an apprenticeship programme.

2. **Intermediate:**

   PTT Intermediate courses are designed for technicians and engineers requiring an understanding of a certain aspect of telecommunications. Those planning to study an Intermediate course should have an understanding of the basic principles of electronic communications.
   The depth of treatment provided by Intermediate courses is typically equivalent to level 3 of a UK national vocational qualification (NVQ). PTT Intermediate courses can be used to support the attainment of a Communications Technology NVQ at level 3.

3. **Advanced:**

   PTT Advanced courses are designed for those who require an in-depth treatment of a certain aspect of telecommunications. Such courses are suitable for system designers as well as those who will be responsible for the maintenance of the system described in the course.
   Those planning to study a PTT Advanced course should have a background in telecommunications, and an understanding of telecommunications fundamentals and the principles of the type of telecommunications system described in the course.

PTT
July 2020