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TQG: IP networks
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.

Course aim:
This online course describes how networks using the Internet protocol reliably deliver data to its intended destination.
Topics discussed include how routes for messages are discovered, and if necessary updated, the efficient use of a limited pool of addresses for large numbers of attached devices, and the conversion from user-friendly names into numeric addresses.

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

Pre-requisites:
An understanding of the role, operation and facilities offered by the Internet protocol (IP). It is suggested the PTT course "Internet protocols" is studied before this "IP networks" course.

Course structure:
The course consists of the following three modules:
1. Routing
2. IP addressing
3. The domain name system

Module 1: Routing

Module aim: To describe the role, basic operation and facilities of routers and route discovery protocols.

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

- explain how a router allows traffic from a local area network to reach devices on other networks.
- explain how a router selects an outgoing link for a packet by referring to its routing table.
- explain that routers can connect different types of network giving examples of typical router interface.
- explain the concept and relevance of path cost giving examples of types of cost including hop count and available link bandwidth.
- describe the role of a route discovery protocol with reference to building routing tables.
- describe the role of advertisement messages in the process of building routing tables.
- compare the performance and facilities of route discovery protocols RIP, OSPF and EIGRP.
- define the term "Autonomous System" and describe the role of an inter-AS route discovery protocol.

Module 2: IP addressing

Module aim: To introduce the concept, advantages and implementation of global hierarchical addressing with reference to the format of IPv4 and IPv6 addresses.

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

- explain that an IP address has global significance and consists of a network identity and host identity.
- describe the format and limitations of classful addressing.
- explain that certain IP address blocks have been reserved for use in private networks
- explain the advantages of hierarchical addressing with reference to subnetting.
- state that Classless Inter-Domain Routing (CIDR) addressing provides more efficient use of available IP addresses than classful addressing.
- describe the format of Ipv6 addresses giving advantages over the Ipv4 classful address format.
- describe ways of allowing devices using IPv6 to communication with those using IPv4.
- explain the concept of broadcasting and multicasting.

Module 3: The domain name system

Module aim: To describe the role, operation and administration of the Domain Name System.

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

- describe the use and structure of Uniform Resource Locators (URLs).
- describe the hierarchical structure of domain names.
- describe the administration of name allocation.
- describe the role of name servers in translating between URLs and IP addresses.
- describe the hierarchy of name servers with reference to root servers, TLD servers and authoritative servers.
- explain the role of the various organisations involved in the administration and operation of the DNS.
- describe the process of address resolution with reference to the interaction between root, TLD, authoritative and recursive name servers.
- explain ways in which a domain name system may be misused for malicious purposes.
- describe methods of protecting the integrity of the DNS.

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
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