EBD: Advanced Ethernet networks
Online course specification

Target audience:
Those responsible for the design, administration or maintenance of corporate Ethernet local area networks.

Course aim:
This course discusses the techniques employed to enhance the security of Ethernet local area networks (LANs), the role and facilities of network management and testing tools, and the services that provide connections between remote LANs.

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

Pre-requisites:
An understanding of the operation of Ethernet local area networks including the allocation of network layer addresses, the translation between different address types and the concept and use of port numbers. It is recommended that the PTT course EBC: "Ethernet networks" is studied before attempting this course.

Course structure:
The course consists of the following four modules:
1. LANs and VLANs
2. Network security
3. Network management and testing
4. Ethernet wide area networks

Module 1: LANs and VLANs

Module aim: Review the operation of an Ethernet LAN with reference to addressing and security and compare the role, operation and facilities of the various types of virtual local area network.

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

- describe the role of switches, routers, and firewalls in a local area network.
- explain the need to translate between MAC and IP addresses.
- describe the role of port numbers when communicating over a LAN.
- describe the advantages of virtual LANs regarding keeping confidential information secure and enabling the mobility of users.
- describe and compare the operation and advantages of port-based and MAC-based VLANs.
- describe the role of an authentication server in improving the security of a VLAN.
- describe role, operation and facilities of tag-based VLANs and their relationship with other types of VLAN.
- describe typical applications and facilities of a private VLAN.
- explain the requirement for a per VLAN spanning tree protocol.

Module 2: Network security

Module aim: Describe various methods of preventing unauthorised access to a local area network and the communications carried over it.

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

- explain that a router can be used to block unwanted access to a local area network.
- describe the role and features of static access lists.
- describe the advantages and operation of reflexive access lists.
- describe the operation and benefits of stateful packet inspection.
- describe the roles and facilities of firewalls and proxy servers.
- describe how MAC flooding and ARP snooping attacks may allow unauthorised access to communications and explain how the attacks can be prevented.

Module 3: Network management and testing

Module aim: Describe the role and facilities of management and control protocols in IP-based networks and the tests that assess the performance of a network connection.

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

- describe the facilities typically provided by a network management system.
- describe the role and facilities of the Simple Network Management Protocol, SNMP.
- describe the role and facilities of the control protocol, ICMP.
- describe the use of the Ping and Trace commands.
- explain the requirement for a loop-back device when testing an Ethernet wide area network connection.
- explain the terms throughput, line rate, latency and frame loss as applied to the performance of an Ethernet wide area network connection.

Module 4: Ethernet wide area networks

Module aim: Describe the benefits and features of the various types of Ethernet-based wide area network.

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

- describe and compare the capabilities of the various types of wide area network connection between a customer's premises and a service provider's network.
- describe and compare the role and characteristics of the various types of Carrier Ethernet service as specified by the MEF.
- describe the significance of the various parameters commonly included in a service level agreement for a Carrier Ethernet service including CIR, CBS, EIR and EBS.
- describe the role of the policing and shaping functions employed with a carrier Ethernet service.
- describe and compare the features, advantages and applications of the various types of technology employed in wide area networks including QinQ VLAN tagging, PBBN and MPLS.
- describe and compare the features and applications of IP over MPLS and Virtual Private LAN Service (VPLS).
- describe the role of VPN clients, VPN servers and the IPsec protocol suite in relation to Internet-based VPNs.
- explain issues relating to routers and firewalls in a VPN

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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