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TFA: Telephony and data services
Online course specification

Target audience:
This course is designed for those who require an appreciation of telephony and data services including those joining the telecoms sector in a managerial or technical role.

Course aim:
To introduce the facilities and capabilities of telephony and data services provided by modern telecommunications networks with reference to the underlying infrastructure.

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

Pre-requisites:
This course does not assume any prior knowledge of telecommunications.

Course structure:
The course consists of the following five modules:

1. Telecoms services
2. Public telephony services
3. Access to data services
4. Wide area networks
5. Private telephony services

Module 1: Telecoms services

Module aim: To introduce the basic infrastructure and services provided by telecommunications networks.

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

- list key events in the evolution of telecoms.
- describe and compare the techniques employed in modern networks to share transmission links between users.
- describe the role of the main elements of a public switched telephone network (PSTN).
- explain that a PSTN employs a centralised service control facility to provide additional services such as number translation.
- explain the concept of cells in a mobile network.
- explain the basic role of the main elements of a mobile network.
- explain that data services use packet switched networks to provide permanent connections between the offices of business customers.
- give examples of the uses of data services by residential and business customers.
- explain that originally all telecoms operators used separate networks for telephone and data services though with some sharing of network resources.
- explain the concept of convergence and the benefits of employing a next generation network to provide all types of service.
- explain the benefits to users and service providers of providing telephony services over broadband connections to a provider's next generation network.

- explain that the Internet consists of a large number of interconnected networks that all use the same transmission protocols.
- explain that various organisations including Internet service providers maintain the infrastructure of the Internet.

Module 2: Public telephony services

Module aim: To describe the capabilities and facilities of systems that provide public fixed line telephone services.

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

- describe the various measures of the quality of service provided by a public telephone network.
- give examples of the facilities offered by a modern public telephony service.
- describe the structure and allocation of numbering for public telephony services.
- describe the need for, and ways of providing, number portability.
- explain the advantages of the service offered by an ISDN giving examples of typical applications.
- describe the provision of international telephone calls with reference to the role of International Switching Centres, E.164 numbering, and echo cancellers.
- describe the basic principles of Voice over IP (VoIP) and the benefits and drawbacks of using a VoIP service.
- describe the role and facilities offered by an Internet telephony service provider.
- describe the obligations placed on public telephony service providers by national regulators regarding the provision of calls to the emergency services.

Module 3: Access to data services

Module aim: To compare the different ways of providing customers with access to the Internet and other data services.

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

- compare the characteristics and applications of the various transmission media.
- explain how a conventional telephone line can be used to access data services.
- compare the capabilities of the various Digital Subscriber Line (DSL) services including ADSL, VDSL, G.fast, and EFM.
- explain that the data transfer rates offered by most DSL services depend on how far the customer is from the exchange.
- explain the concept of contention and the effect of the contention ratio on achievable data transfer rates.
- explain the benefits offered by optical fibre for residential and business customers requiring access to data services with reference to the various implementations of fibre services including FTTC, FTTP and FTTB.
- describe the data transfer capabilities and typical applications of other methods of accessing the Internet including 4G and 5G mobile services, WiFi, hybrid fibre coax (HFC), fixed wireless access (FWA), and Ethernet leased lines.
- Explain that some services can offer certain performance guarantees while others cannot.

Module 4: Wide area networks

Module aim: To describe the role, capabilities and facilities of wide area networks.

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

- describe applications and typical structures of wide area networks.
- explain the concept, role and benefits of virtual circuits.
- describe the benefits and applications of a Virtual Private Network.
- explain the concept and applications of a virtual LAN.
- describe the role of a service level agreement and the relevance of defining a quality of service.
- Give examples of the types of performance guarantees given with various types of data service.
- explain that ISPs maintain Points of Presence which combine traffic from customers for onward transmission to the Internet.
- describe the services typically provided by Internet Service Providers.
- explain that the Internet does not offer performance guarantees and that performance can degrade during network congestion.
- explain the role of routers.
- explain the role of the various types of server including web servers, domain name servers and email servers.
- explain the vulnerability of networks to malicious attack and describe methods of increasing the security of communications over wide area networks.
- describe and compare the various types of cloud service giving their benefits and typical uses.

Module 5: Private telephony services

Module aim: To describe the facilities offered by, and methods of providing, a private telephony service.

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

- describe the role of a PABX with reference to trunk connections and extensions.
- explain that a CENTREX service provides the facilities of a PABX without the use of on-site equipment.
- describe the role of various in-bound call distribution techniques including direct dialling in, hunt groups, group pickup, auto attendant, automatic call distribution, and interactive voice response.
- explain the benefits of using voice over IP in a private telephony system instead of circuit-switching.
- describe the role of the various components of a private telephony system using VoIP techniques including IP PBX, PSTN gateway, IP phone, softphone, DECT base station and WiFi access point.
- explain that a SIP trunk provides an alternative to a PSTN gateway for external calls.
- describe the benefits of using, and facilities offered by, an Internet telephony service provider.
- describe the concept and role of virtual numbers and virtual extension numbers, and their benefits for smaller businesses.
- describe the role of least cost routing, giving typical applications.

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
August 2023