

## VAA: Introduction to telephony

### Online course specification

**Target audience:**

Those responsible for the maintenance of private or public telephony systems.

**Course aim:**

This course introduces the principles of operation, components and structure of telephony systems, discusses the issues that affect how calls are routed over networks, and describes the administration and provisioning of private telephony services.

**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 data communications and the fundamentals of digital encoding and transmission.

**Course structure:**

The course consists of the following four modules:

1. Telephony fundamentals
2. Voice over IP
3. Call routing
4. Teletraffic engineering

**Module 1:** Telephony fundamentals

Module aim: This module introduces the fundamental principles and operation of telephony systems.

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

- describe the role and facilities of, and technologies employed in, various types of telephony system with reference to private, public, and mobile services.
- explain that the convergence of telephony and data services has driven the replacement of circuit switched services with those based on voice over IP techniques.
- describe the role of the processes involved in making a telephone call including signalling, routing, resource allocation, call control, and billing.
- describe the need for, and role of, authentication, authorisation and accounting.
- explain the functions of signalling including setting up and releasing transmission resources, sending address information and capability negotiation.
- list and explain the role of the various information audio tones including dialing tone, busy tone and ringing tone.
- explain that there are several types of signalling in use in telephony systems giving examples of their use and the standards bodies responsible for their development.
- describe the sequence of events that occur during the setting up a call.

## **Module 2: Voice over IP**

Module aim: This module introduces the operation of telephony systems employing packet switching.

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

- describe the advantages of a Voice over IP (VoIP) telephony service over that provided over a circuit-switched network.
- explain the basic principles of carrying voice samples in IP packets.
- describe the causes and effects of packet delay on a VoIP service.
- explain the transmission requirements of speech with reference to bandwidth and delay.
- explain the benefits of using a network with a defined quality of service (QoS).
- describe the measures taken to ensure that voice traffic is provided with an acceptable QoS.
- describe the role of class of service indications in ensuring VoIP traffic is given priority over other types of traffic more tolerant of delay.
- describe the role of SIP user agents and voice gateways.
- describe the role and format of a SIP user identity.
- explain that the functions of a softswitch include registration, authentication, and address translation.

## **Module 3: Call routing**

Module aim: This module describes how calls are routed over telephony systems and the factors that influence routing decisions.

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

- explain how the format of geographic numbering conforming to the E.164 standard relates to the hierarchical structure of a PSTN.
- explain that competing communications providers in a country are allocated number ranges by the national regulator.
- describe how calls are routed over a PSTN with reference to the various types of switching centre and geographic numbering.
- describe the call routing processes involved in routing calls to a ported number.
- explain that the use of voice over IP techniques for public telephony reduces the number of switching centres required.
- describe the role, operation, and applications of number translation with reference to conditional and not-conditional call forwarding, and special services calls.
- explain the role of location servers in the provision of nomadic operation of VoIP systems, and their use by mobile services and VoIP-based public telephony services.
- describe the role of inbound routing giving examples of its use.
- describe the obligations of communications providers in relation to emergency calls with reference to public service access points and the passing of location information.
- describe the role of outbound routing with reference to least cost routing and emergency routes.

#### **Module 4:** Teletraffic engineering

Module aim: To describe methods of ensuring an adequate grade of service and maximum availability of a telephony system.

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

- define the Grade of Service of a telephony service in terms of blocking probability.
- define the Erlang unit of traffic load.
- explain the relationship between blocking probability and the number of available circuits.
- explain that there are formulae available to determine the number of circuits required to ensure a particular grade of service for an expected traffic load.
- compare the role and applications of the Erlang B and Erlang C formulae.
- explain how the required Grade of Service affects the total bandwidth requirement of a Voice over IP system.
- define Availability in relation to the reliability of a telephony system.
- describe the measures taken to maximise the availability of a telephony service with reference to automatic switch protection, failover server clusters, and load balancing.
- describe the role of dial plans, voice policies and PSTN usage records in controlling access to telephony services.

**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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