

# MediaNet

learntelecoms interactive e-learning suite of courses from PTT:  
MediaNet v2—Voice and video service delivery

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## MediaNet

is a suite of interactive, multimedia e-learning courses designed to run under Windows™ 2000 Professional, XP or Vista.

- provides training in the technical aspects of delivering voice and video services.
- consists of four separate but integrated courses:

- A Voice switching
  - B Voice over IP
  - C C7 signalling
  - D Video over IP
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## Each MediaNet course:

- provides several hours of in-depth, authoritative technical training
  - employs interactive simulations, hypertext links and question sessions to fully involve the trainee in the learning experience.
  - provides personalised training with each trainee able to make his/her own notes and place
  - bookmarks. A record of progress and level of achievement is recorded for each trainee.
  - provides a structured assessed course and can also be used to browse for revision or reference.
  - can be studied in isolation or as an integrated suite; each chapter of a course includes revision links to relevant subjects covered in the other MediaNet courses.
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## Target audience:

MediaNet is designed for:

Those studying for a career in telecommunications and who require a detailed knowledge of telephony and video systems.

Technical staff involved in the operation, installation or maintenance of systems that deliver telephony and/or video-based services.

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**Introduction:**

Telephony is undergoing a revolution in the technologies used and the services provided. This course covers the principles of circuit-switched telephony. The course also covers subjects, such as teletraffic engineering and signalling, that are not only relevant to conventional telephone networks but also Voice over IP (VoIP) services.

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**Course aim:**

This course provides an introduction to the principles and operation of circuit-switched telephony as used in the Public Switched Telephone Network (PSTN).

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**Pre-requisites:**

Secondary (high) school education in Physics. In the UK, appropriate pre-requisite qualifications are General Certificate of Secondary Education (GCSE) in Physics or BTEC National Vocational Qualification (NVQ) at level 2 in Electronics.

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**Course content:**

**Introduction to the PSTN:** Overview of the components and structure of the PSTN; review of the functional elements of an exchange; setting up a call over the PSTN; numbering in the PSTN.

**Principles of signalling:** Functions of signaling in a system providing a telephony service; the role of local and inter-exchange signaling; message exchange in call set-up and release for both a conventional call and a call involving the Intelligent Network (IN); introduction to the concepts of Channel Associated Signalling (CAS) and Common Channel Signalling (CCS).

**Signalling in the local loop:** Use of Channel Associated Signalling methods including loop/disconnect and DTMF; functional components of a telephone; role of audio information tones; provision of a Calling Line Identity (CLI) service.

**Inter-exchange signalling:** Use of Common Channel Signalling (CCS) between exchanges; benefits of the use of CCS; role of various types of signaling point in a signalling network; path diversity in the signaling network; types of CCS used in the PSTN, ISDN and private networks; role of, and relationship between, the various protocols used by the common channel signalling system number 7 (C7); role of signaling messages involved in call set-up.

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**The Intelligent Network:** Services provided by the Intelligent Network (IN); role of, and interaction between, C7 signalling protocols in the IN including ISDN User Part (ISUP) and IN Application Part (INAP); provision of supplementary services including call forwarding; role of Service Control Point (SCP); number translation procedure for non-geographic numbers

**Teletraffic Engineering:** Grade of Service; the Erlang; Blocking probability; relationship between blocking probability and the number of available circuits; Erlang B and Erlang C formulae; Availability; Post Dial Delay.

**Appendix:** Information on older inter-exchange Channel Associated Signalling (CAS) systems no longer in use in modern networks including in-slot and out-of slot PCM signalling, in-band and out-of-band tone (R2) signalling and E & M signalling (not assessed).

**Multimedia traffic:** Multimedia traffic sources; requirements for a broadband multimedia WAN; the causes

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**Introduction:**

The provision of telephony over the same types of network that carry Internet traffic is an increasingly important subject for the telecommunications industry. So-called Voice over IP (VoIP) services are likely to become as prevalent as conventional PSTN services.

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**Course aim:**

This course provides an introduction to the principles and operation of telephony services that operate over Internet Protocol (IP) networks.

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**Pre-requisites:**

Understanding of issues relating to the provision of a public telephone service including numbering, role of signalling and Grade of Service calculations. It is recommended that MediaNet course A: "Voice switching" is studied before attempting this course.

**Also:** understanding of the principles of operation of networks using IP. The PTT e-learning course TransNet course F: "IP networks" covers this topic. Although not a pre-requisite, the study of TransNet course G: "Advanced IP networks" would also aid the understanding of the transmission aspects of a VoIP service.

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**Course content:**

**VoIP packet transport:** review of the advantages of a Voice over IP (VoIP) telephony service over that provided over a circuit-switched network; basic principles of carrying voice samples in IP packets; effects of the network impairments delay, jitter and packet loss; methods of minimising network impairments; target Quality of Service for an IP network carrying VoIP traffic.

**Voice encoding and bandwidth:** processing of speech including PCM encoding, echo cancellation, compression and silence suppression; characteristics of typical encoder types; packetisation of speech segments; bandwidth requirements of a VoIP service.

**VoIP systems:** review of the processes involved in making a telephone call inc. routing, signalling, call control and speech transmission; introduction to the signalling protocols SIP and H.323; functions of a call server in a VoIP system; role of gateways; review of VoIP service parameters inc grade of service, availability and post-dial delay; review of techniques to reduce transmission delays; admission control techniques.

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**Session Initiation Protocol (SIP):** role of the functional components of a VoIP system using SIP including user agent, proxy server, location and redirect servers; role of a DNS server in a SIP system; role of Session Description Protocol (SDP); format of SIP messages inc. INVITE and responses inc. "200 OK"; role of SIP header fields inc. "To:" and "Via" and media attributes; signalling message flow during call set-up and release; operation of SIP facilities including authentication, call forwarding, call-on-hold and call forking.

**H.323 VoIP systems:** role of the various protocols involved in providing an H.323 audiovisual service inc. H.225, H.245, and the Real-time Protocol (RTP); components of an H.323 system inc. gateways and gatekeepers; gatekeeper functions inc. registration and address translation; direct and gatekeeper routed signalling modes; message exchange during call set-up inc admission control, call signalling, capability negotiation and media channel initiation; methods of reducing post-dial delay inc. "Early H.245", "fast connect" and H.245 tunneling; call forwarding in an H.323 system

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**Introduction:**

C7 signalling conforms to an international standard and is used throughout the world in the Public Switched Telephone Network (PSTN) and the Integrated Services Digital Network (ISDN). C7 is used in conjunction with the Intelligent Network (IN) to provide enhanced call facilities and also has an important role in the operation of mobile telephony services. C7 is also used over the interface between the PSTN and Voice over IP systems.

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**Course aim:**

This course provides a detailed treatment of the principles and operation of C7 signalling systems in both fixed and mobile telephony networks.

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**Pre-requisites:**

Understanding of issues relating to the provision of a public telephone service including numbering, switching and the role of signalling in a telephony system. It is recommended that MediaNet course A: "Voice switching" is studied before attempting this course.

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**Course content:**

**Introduction to C7 signalling:** review of the advantages of Common Channel Signalling (CCS); modes of operation of CCS systems; role of the various components of a CCS signalling network inc. Service Switching Point (SSP). Signalling Transfer Point (STP) and Service Switching Point (SSP) and Service Control Point (SCP); signalling network structure; relationship between the protocols used in C7 systems and their roles.

**Message transfer:** Introduction to the concept of MTP signal units; structure of the different types of signal unit; significance and role of a message routing label; error correction mechanisms.

**MTP signalling link and route management:** Operation and role of link changeover and forced rerouting; structure of a management signal unit; significance of the various management messages.

**The Telephony User Part (TUP) of C7:** Role of the TUP; format of TUP signalling messages; sequence of events for call set-up and release; TUP supplementary services; disadvantages of TUP.

**The ISDN User Part (ISUP) of C7:** Advantages and features of ISUP; format of ISUP signalling messages; basic call set-up and provision of supplementary services using ISUP; end-to-end and user-to-user signalling.

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**The Signalling Connection Control Part (SCCP) of C7:** The role of SCCP; SCCP classes of operation; the structure of SCCP messages; global title translation; information retrieval from remote databases. **The Intelligent Network Application Part (INAP) of C7:** The functional and physical elements of an Intelligent Network; the role of the INAP; Application Service Elements (ASE), operation and parameters; demonstrations of typical INAP operations.

**The Mobile Application Part (MAP) of C7:** Review of the functional and physical elements of a GSM network and GSM network numbering; the role of the MAP; MAP services, dialogues and parameters; demonstrations of the use of MAP in locating a mobile, setting up incoming and outgoing mobile calls, and call handover.

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**Introduction:**

The provision of so-called triple play services - telephony, Internet access and video - over DSL broadband connections is seen as the way forward by many in the telecommunications industry. This course discusses the technical aspects of providing a Video over IP service.

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**Course aim:**

This course provides an introduction to the principles and operation of video services that operate over Internet Protocol (IP) networks.

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**Pre-requisites:**

Understanding of the operation of IP networks and the advanced techniques used to improve the performance of such networks. It is recommended that the PTT e-learning courses TransNet course F: "IP networks and TransNet course H: "Advanced IP networks" are studied before attempting this course.

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**Course content:**

**Video fundamentals:** Explanation of the terms pixels, lines, frames and display resolution; principles and advantages of interlaced scanning; composition of an analogue colour video signal in terms of its luminance, chroma and synchronisation components; types of analogue video systems including PAL and NTSC.

**Digital video standards:** Advantages of the digital representation of video; encoding of luminance and colour difference information with reference to the 4:2:2 format as specified in ITU BT.601; description of the Serial Digital Interface (SDI) for video transmission as specified in BT.656; summary of the various DVB broadcast formats with details of DVB-T; characteristics of high definition television (HDTV).

**Video compression:** Explanation of the techniques used to reduce the number of bits required to transmit video images; description of the compression methods used by MPEG encoders with reference to I, B and P frames; concept and structure of a Group Of Pictures (GOP); summary of the capabilities of the MPEG-1, 2 and 4 encoders.

**MPEG media streams:** Explanation of the concept and use of programme streams and transport streams; structure of a Packetised Elementary Stream (PES) packet; structure of a transport stream packet with reference to the role of the Packet Identifier (PID) and Programme Clock Reference (PCR); role of programme association and programme map tables; transmission of transport streams over an IP network; use and characteristics of an DVB-ASI interface.

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**Video services:** Review of the components of an H.323 based video conferencing system; description of the various types of streaming including progressive download and true streaming; explanation of the concepts of unicasting and multicasting; features of narrowcasting and video on demand services.

**Video over DSL:** role of functional components of a Video over IP service in the service provider's network and at a customer's premises; role and comparison of transport protocols involved including RTP. Description of the equipment and protocols involved in multicasting; concept of a multi-cast group; role of IGMP messaging.

**Testing IPTV:** Review of causes of IP network impairments including errors, delay and jitter; effect of network impairments upon a Video over IP service; description of the factors that affect channel changing speed; description of the various tests that should be carried out on a Video over IP system; description of the types and capabilities of IPTV test equipment.