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Ethernet Local Area Networks

LanNet

- is a suite of interactive, multimedia e-learning courses designed to run under Windows XP, Vista or Windows 7.
- provides training in the technical aspects of Ethernet Local Area Networks.
- consists of two separate but integrated courses:

  A: Ethernet fundamentals and structured cabling
  B: Ethernet networks

Each LanNet 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 on 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.

Target audience:

- Those studying for a career in data communications and who require a detailed knowledge of Ethernet Local Area Networks.
- Technical staff involved in the design, installation or maintenance of Local Area Networks.

Courses for further study:

The following PTT online courses are suggested for study once the LanNet courses have been completed:

- TAF: IP networks
- TAG: IP routing
- TAH: Advanced IP networks

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LanNet v2
LAA: Ethernet fundamentals and structured cabling

Course aim:

This course provides an introduction to the fundamental concepts that underpin the operation of Ethernet Local Area Networks and describes the benefits and components of a structured cabling system.

Pre-requisites:

You will get the most out of this course if you already have an understanding of the fundamentals of the nature of analogue and digital signals and the impairments that affect them. A basic understanding of digital communications and the role of data protocols will also be useful.

It is recommended that the PTT online courses SRA: “Analogue and digital signals” and SRC: “Data communication principles” are studied before attempting this Ethernet fundamentals course

Topics covered:

Introduction to Ethernet: Basic functions and components of a Local Area Network (LAN); the importance of standards for communications; introduction to the bodies responsible for formulating standards; history of the evolution of the Ethernet standards; role of the IEEE working groups in formulating and revising Ethernet standards.

The Ethernet protocols: Introduction to the protocols used in Ethernet LANs, including LLC and MAC; format of the Ethernet 802.3 frame and the role of the individual fields; role of the LLC protocol; role and operation of CSMA/CD in allowing devices to share the transmission medium; description of alternative Ethernet frame formats including SNAP.

Ethernet LANs: Description of the physical media, basic components, topology and features of tEthernet LANs from 10BASE-T to 10GBASE-LR; the various ways of interconnecting devices on a LAN including those serving a large office building; comparison of the roles of hubs, repeaters and switches and the capabilities of various types of Ethernet LAN.

LAN cables: Comparison of the various types of cable used in local area networks; parameters used to assess the electrical properties of copper cables and the factors that can degrade the performance of cables; description of copper and optical cabling categories and classes.

Structured cabling: The concept of structured cabling and its advantages and disadvantages; description of the structure and components of a structured cabling system; overview of the various standards applicable to structured cabling; role, components and structure of an earthing system.

Cable testing: The importance of testing; choosing appropriate test equipment; definition of links and channels; description of appropriate test configurations; overview of standards relevant to testing; significance of the various test parameters; description of the common causes of test failure.

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LAB: Ethernet networks

Course aim:

This course provides detailed information about the components, operation, management and security aspects of an Ethernet Local Area Network, introduces the concept and application of virtual private networks and discusses the use of Ethernet in wide area networks (“Carrier Ethernet”).

Pre-requisites:

A basic understanding of digital communications and the role of data protocols, and an understanding of the basic principles of Ethernet local area networks (LANs).

It is recommended that the PTT online courses SRC: “Data communication principles” and LAA: Ethernet fundamentals are studied before attempting this course.

Topics covered:

Ethernet LANs: Advantages of Ethernet bridges and switches and how they build their address tables; causes and effects of network loops and how they can be avoided; the role of bridges when interconnecting local area networks.

Ethernet switching: Comparison of store and forward, and cut-through switching; role and operation of the Spanning Tree Protocol; features and comparison of port-based and segment-based switching; full duplex port operation; buffering and flow control issues for dual and triple speed switches.

Routing and switching: advantages of layer 3 routing compared with layer 2 switching; the basic structure of an IP packet and the nesting of information from different protocol layers; role of routers, routing tables and route discovery protocols.

Addressing: Relationship between IP and MAC addresses, role and operation of Address Resolution Protocol, ARP; significance of TCP/UDP port numbers, comparison of static and dynamic (DHCP) IP addressing; role and operation of Network Address Translation (NAT).

Network security: Role of security in Local Area Networks (LANs); role and features of static access lists; advantages and operation of reflexive access lists; operation and benefits of stateful packet inspection; role and facilities of firewalls and proxy servers.

Network management: role and facilities of the Simple Network Management Protocol, SNMP; role and facilities of the control protocol, ICMP and use of the Ping and Trace commands; testing the performance of an Ethernet-based wide area network connection.

Ethernet wide area networks: The various ways of interconnecting remote Ethernet LANs, including those based on carrying Ethernet frames over SDH links, and those based on the MPLS protocol. The advantages of a Virtual Private Network (VPN), role of VPN clients, VPN servers and the IPsec protocol suite, and issues relating to routers and firewalls in a VPN;