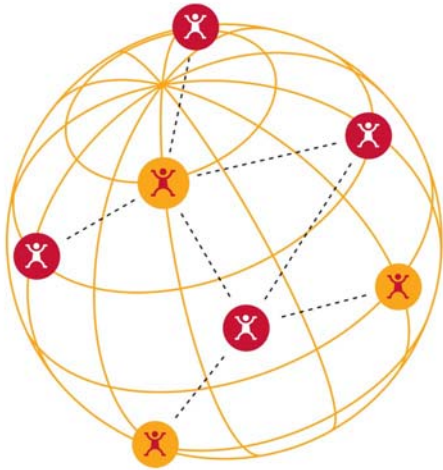


TRAINING PROGRAM OUTLINE



ENG-412E TCP/IP NETWORK FUNDAMENTALS

DESCRIPTION

A 10-day Training Program to provide participants with a working knowledge of data networks and TCP/IP and an opportunity to put into practice this knowledge. The Training Program is divided into three parts:

1. *Introduction to data networks and TCP/IP* which delves into the nuts and bolts of the technologies and protocols that drive the Internet and today's corporate networks.
2. *Switching in TCP/IP networks* which provides the tools required to design and build a switched campus network. Through practical hands-on activities, the participant will construct a working Local Area Network (LAN) and steadily grow its complexity to ultimately build a small scale switched campus network.
3. *Routing in TCP/IP networks* which provides the tools required to design and build a routed network. Through practical hands-on activities, the participant will learn different ways to carry out routing within an autonomous system.



OBJECTIVES

- Explain the fundamental principles of data networks and the functions and hierarchy of IP networks
 - Understand and practice the techniques of IP addressing and subnetting
 - Describe the different networking devices (hub, switch, router)
 - Understand the concepts of collision domains and broadcasting domains
 - Explain the main services on IP networks: DHCP, DNS, HTTP, FTP and WWW
- Explain the fundamentals of a switched data network
 - Describe in detail the functions of an Ethernet switch
 - Understand the Spanning Tree Protocol (STP) and learn how to build a Virtual Local Area Network (VLAN)
 - Practice different configuration scenarios on an Ethernet switch
 - Learn to design and configure a small-scale switched campus network
- Explain the fundamental characteristics of routing
 - Explain and understand router functions and routing protocols: RIP, OSPF, IGP and BGP
 - Understand and practice the configuration of a router with different features and routing protocols
 - Learn to design and configure a small scale routed network within an autonomous system

TOPICS

Part 1: Introduction to data networks and TCP/IP

- Introduction to networks
 - The advantages and disadvantages of networking
 - Network characteristics
 - Network types and topologies



- What are protocols?
- Network classification
- Circuit and packet switching networks
- Connection-oriented and connectionless protocol

- OSI model and the TCP/IP protocol suite
 - The OSI model
 - TCP/IP protocol suite
 - TCP/IP versus OSI model

- Physical layer
 - Functions
 - Electromagnetic spectrum and bandwidth
 - Coding and modulation
 - Networks connecting equipments

- Data link layer
 - The functions of the data link layer
 - The MAC layer as a shared medium
 - The Ethernet technology
 - Switching on layer 2
 - Collision domain and broadcast domain

- Network layer
 - Introduction to counting systems
 - Functions of network layer
 - IP addresses
 - Subnetting

- Classless IP addresses
 - Variable-Length Subnet Mask (VLSM)
 - Classless Inter-Domain Routing (CIDR)
 - Network Address Translation (NAT)

- ARP and RARP
 - Position of ARP and RARP in TCP/IP protocol suite
 - Packet format
 - Encapsulation



- Operation
- The IP protocol
 - Position of IP in TCP/IP protocol suite
 - IP datagram format
 - The options
- Internet Control Message Protocol ICMP
 - Position of ICMP in the network layer
 - The ICMP message format
 - The types of error reporting messages
 - The types of query messages
 - Ping and traceroute commands
- Transport layer
 - Functions
 - Transmission Control Protocol (TCP)
- User Datagram Protocol (UDP)
 - Process-to-process communication
 - Format of a UDP user datagram
 - Operation of UDP
 - Use UDP
 - UDP package
 - TCP versus UDP
- Application layer
 - Functions
 - Dynamic Host Configuration Protocol (DHCP)
 - Domain Name System (DNS)
 - File Transfer Protocol (FTP)
 - Hyper Text Transfer Protocol (HTTP)
 - How HTTP accesses data on the World Wide Web (WWW)



Part 2: Switching in TCP/IP networks

- Introduction
 - Networking evolution
 - LAN equipment
 - Switching hierarchical model

- LAN technologies
 - LAN terminology
 - Ethernet: the de facto LAN standard
 - Different flavours of Ethernet
 - Additional Ethernet features
 - Alternative LAN technologies

- Segmentation
 - What is segmentation?
 - Segmentation equipment

- Spanning Tree Protocol (STP)
 - Network redundancy and reliability
 - Spanning tree topology
 - Spanning tree operation
 - Spanning tree port states
 - Rapid Spanning Tree Protocol (RSTP)

- Virtual LANs (VLANs) and trunking
 - Virtual LAN (VLAN)
 - Types of VLANs
 - Trunking
 - VLAN example
 - VLAN Trunking Protocol (VTP)
 - Inter-VLAN protocols

- Advanced features and services
 - Multitrunking and EtherChannel
 - Spanning trees and VLANs
 - Load balancing
 - Multicast management



Part 3: Routing in TCP/IP networks

- Network design goals
 - Design goals
 - Reliability
 - Resiliency
 - Manageability
 - Scalability

- Fundamental routing concepts
 - Routing definition
 - Inside the router: the control and forwarding planes
 - Static routing
 - Dynamic routing and routing protocols
 - Administrative distance
 - Routing metric
 - Neighbour relationships
 - Autonomous systems
 - Interior vs. exterior routing protocols
 - Routing protocol selection

- Management of IP address use
 - Network Address Translation (NAT)
 - Route summarization
 - Classless Inter-Domain Routing (CIDR)
 - Relay agents

- RIP: an interior routing protocol
 - RIP description, terminology and concepts
 - Distance-vector routing algorithm
 - Limitations and problems associated with RIP and how to tackle them
 - RIP versions: message formats and features
 - RIP configuration and analysis

- OSPF: an interior routing protocol
 - OSPF description, terminology and concepts
 - Link-state routing algorithm
 - OSPF basic topology



- OSPF hierarchical topology: the concept of areas and router roles
- OSPF message types and formats
- OSPF configuration and analysis
- Synopsis of other interior routing protocols
 - IGP
 - Enhanced Interior Gateway Routing Protocol (EIGRP)
 - Intermediate System to Intermediate System (IS-IS)
- BGP: the Exterior Routing Protocol (ERP)
 - BGP description, terminology and concepts
 - BGP operation
 - Overview of more advanced topics, such as route reflectors, policy control and prefix lists

TARGET AUDIENCE

- Technical personnel in engineering or operations interested in
 - Acquiring a working knowledge of data networks and TCP/IP
 - Learning how to design switched TCP/IP networks
 - Learning how to design routed TCP/IP networks



METHODOLOGY

Our Training Programs combine expert presentations, workshops, and hands-on laboratories. Complete training material is provided to all participants for future reference and follow-up action plans.

LOCATION

Our Training Programs are held at regular intervals in selected cities around the world. Upon request, our expert trainers can lead Training Programs at the location of your choice. If interested, please contact us at training@neotelis.com.

EXPERTISE

Neotelis provides consulting and training services to organizations worldwide. Its team of experts has trained thousands of individuals in technical, managerial and executive roles, who are working for operators, regulators, policy-makers, governments and private sector corporations in over 100 countries around the world.

