Network Systems Training (UK) Ltd

Course Catalogue

2017

http://www.nstuk.com

Table of Contents

TCP/IP & LAN Technologies

This course has been designed to provide delegates with a basic theoretical knowledge of Internetworking and focuses on the use of the TCP/IP protocol suite. Included in the course is a breakdown of the Internet Protocol version 4 address structure and how a network is logically subdivided through the use of subnetting. This course forms part of the prerequisites for further networking courses such as Cisco's Interconnecting Cisco Network Devices (ICND).

Prerequisites

None, although a basic understanding of Data communications would be beneficial.

Learning Objectives

At the end of this class, participants will be able to:
Understand the basic history of the Internet.
Understand the terms WAN, LAN, MAN, Internet and Intranet.
Determine the functions of the Open Systems Interconnect 7 Layer Model.
Determine the functions of the Internet Protocol 4 Layer Model.
Differentiate between different standard Network Topologies.
Understand the basic functions of a Hub, Switch and Router.
Comprehend the difference between Distance Vector and Link State Routing Protocols.
Determine the function of TCP/IP Protocols and at what layer of the Protocol Stack they operate.
Determine the Class of a given IP address.
Perform subnetting of a given network address.

Who Should Attend

Network technicians, Technical Managers and Support Staff who need an overview of networking technologies relating to the TCP/IP protocol suite.

Class Length

Two days

Cost of the Course

See current Course Schedule

Introduction to Voice over IP

This course has been designed to provide delegates with knowledge of the fundamental principles of Voice over Internet Protocol. IEEE standard H.323 and the Open Standard Session Initiation Protocol (SIP) are described and compared.

Prerequisites

A basic knowledge of TCP/IP.

Learning Objectives

At the end of this class, participants will be able to:
Understand the reasons for the development of voice over data networks.
Have an appreciation of factors affecting voice quality.
Understand the IETF protocols developed to allow real-time media of data networks.
Determine the function of the real-time protocols and where in the protocol stack they operate.
Understand the elements and function of the ITU-T H.323 umbrella protocol.
Understand the basic functions of the IETF Session Initiation Protocol and compare it's operation to that of H.323.
Differentiate between various Quality of Service (QoS) methods employed.
Determine how Layer 3 Multicast addresses are mapped to Layer 2 Multicast addresses.

Who Should Attend

Network technicians, Technical Managers and Support Staff who need an overview of Voice over IP fundamentals.

Course Outline

Introduction to Voice over Internet Protocol.
Voice Quality Issues.
Protocols.
H.323 and Network Elements.
SIP – Session Initiation Protocol.
QoS - Quality of Service.
Multicasting.

This course is theory-based but does include a small exercise in Multicast Addressing.

Course Content

Section 1 – Voice over IP Fundamentals

Introduction to Voip
Contacts
Preliminaries
Aims and Objectives
VoIP—How it works.
VoIP—Encapsulation
Associated Internet Protocols)
Networks
- The Internet
- VPNs
- Enterprise Networks
- Service Provider Networks

Why VoIP ?
VoIP—What does it offer ?
- Carrier Class
- Enterprise Class
- Single Clients

VoIP—Regulatory Bodies

Section 2 – Voice Encoding Schemes

Waveform Encoders
Vocoders
Pulse Amplidude Modulation
Pulse Code Modulation
Vocoders
Common Codecs
Mean Opinion Score (MOS)
Voice Quality
- Latency
- Packet Jitter
- Packet Loss

Silence Suppression
Echo Problems
- Acoustic Echo
- Hybrid Echo

Echo Suppression
Echo Cancellation

Section 3 – Protocols (Network & Transport Layers)

OSI—7 Layer Model
- Application Layer
- Presentation Layer
- Session Layer
- Transport Layer
- Network Layer
- Data-Link Layer
- Physical Layer

Encapsulation
H.323 Protocol Stack
IPv4
Transmission Control Protocol (TCP)
- Multiplexing of Ports
- Passive and Active Connections
- TCP Header
- Sliding Windows
- 3-way Handshake

User Datagram Protocol (UDP)
- UDP Header

Section 4 – Real-Time Protocols

Real-time Transport Protocol (RTP)
- RTP Header
- Encapsulation Overhead
- Header Compression
- RTP Translators
- RTP Mixers

Real-time Control Protocol (RTCP)
- RTP Header
- Sender Reports (SR)
- Receiver Reports (RR)
- Session Description (SDES)
- Bye Packets
- Application Specific Packets
- Internet Telephony Classes

Section 5 - H.323 & Network Elements

H.323 Standard
Protocol Stack
Components
- Terminals
- Gateways
- Gatekeeper
- Multipoint Control Units (MCUs)

Media Gateway Control Protocol (MGCP)
Signalling Methods
- Gatekeeper Discovery
- Gatekeeper Registration
- Admission
- H.225 RAS
- H.225 (Q.931)
- H.245 Control

FastStart

Section 6 - Session Initiation Protocol (SIP)

SIP Topology
SIP Operation
SIP Signalling Messages
SIP Transaction
SIP Message Format
Session Description Protocol (SDP)
SIP Header Format
SIP Servers
- Registrar
- Redirect
- Proxy

Section - 7 Cisco VoIP Example

Cisco IP Telephony Components
Basic Functionality
IP Phone Power Supply Options
Cisco Call Manager Platforms
Basic Deployment Model
Secondary Server Functions
SRST— Survivable Remote Site Telephony
Deployment Example

Section 8 — Quality of Service (QoS)

QoS Definition
Congestion Control
QoS Models
Integrated Services (Intserv)
Resource Reservation Protocol (RSVP)
Differentiated Services (Diffserv)
IPv6 Route Aggregation
Congestion Control
    Packet Classification
    Scheduling
Queuing Techniques
    FIFO — First In First Out
    Priority Queuing
    Custom Queuing
    Weighted Fair Queue
    Low Latency Queuing
MPLS Overview

Section 9 — Multicasting

Multicast Enabled Components
Review of Address Types
    Unicast
    Broadcast
    Multicast
Multicast Applications
Tunnelling
Distributed Protocols
Packet Storms
Multicast Addressing
    Hardware (Layer 2)
    Internet Protocol (Layer 3)
    Mapping
IGMPv1
IGMPv2
Multicast Forwarding Algorithms
    Flooding
    Reverse Path Broadcast (RPB)
    Truncated Reverse Path Broadcast (RPB)
    Reverse Path Multicast (RPM)

Class Length

Two days

Cost of the Course

See current course schedule

Routing and Switching

This course has been designed as an introduction to Routing and Switching technologies using Cisco hardware. The course focuses on the fundamental concepts of LAN switching as well as basic routing functions. The balance of the course is approximately 50/50 in terms of theory and practical 'hands on' exercises and is ideal for those delegates who are responsible for basic configuration and troubleshooting of Cisco IOS devices.

Prerequisites

A basic knowledge of TCP/IP and Datacomms and some exposure to Cisco devices.

Learning Objectives

At the end of this class, participants will be able to:
Understand the startup routines for Cisco Routers and Catalyst Switches running IOS.
Understand the cabling requirements for interconnection of Cisco devices.
Confidently utilise various open and proprietary protocols to effectively manage switches and routers.
Configure and interrogate Layer 2 devices for basic operation.
Configure a Cisco 2960 catalyst switch for basic VLAN operation.
Understand the importance of loop avoidance mechanisms utilising IEEE 802.1d and 802.1w (Spanning Tree).
Configure basic Port Security on Cisco Catalyst switches running IOS.
Configure PortFast, UplinkFast and BpduGuard.
Configure FastEtherchannel Trunks
Provide inter-vlan routing with a 'Router on a Stick'.
Configure basic routing services with RIP and IGRP
Configure OSPF in a single area.
Configure OSPF in multiple areas.
Configure EIGRP with VLSM and summarization.
Manage traffic flow with Access Control Lists.
Configure OSPFv3 for IPv6

Who Should Attend

Network Technicians, Administrators and Network Engineers responsible for basic configuration maintenance of Cisco IOS based Routers and Catalyst Switches.

Course Content

Section 1 – Course Introductions

Course Introductions
Aims and Objectives
Course Syllabus

Section 2 - Basic Layer 2 Switching

Catalyst Switch Startup Procedures
Basic Configuration
Review of Layer 2 Switching
- Address Learning
- Filtering
- Spanning Tree Loop Avoidance

MAC Address Tables
Port Security
PortFast, UplinkFast
Fast EtherChannel

Section 3 - Virtual Local Area Networks

VLAN Basics
VLAN Trunking Protocol (VTP)
Configuring VTP
ISL Trunks
IEEE 802.1Q Trunks
Inter-Vlan Routing

Section 4 - Routing Review

Router interfaces
Router memory components
Managing Configuration Files and IOS Images
Router Startup Procedures
Getting Started (Basic Configuration)
Review of Routing Basics
Distance Vector Routing Protocols
Configuring and managing RIPv1
Configuring and managing RIPv2
Configuring Single Area OSPF
Configuring Multiple Area OSPF
Configuring EIGRP with VLSM
Configure OSPFv3 for IPv6

Class Length

Three days

Cost of the Course

See current course schedule

MPLS Fundamentals

This course has been designed to provide delegates with a fundamental knowledge of MPLS (Multi Protocol Labelled Switching) and focuses on the Operation of MPLS, Label Distribution, MPLS QoS and MPLS VPNs. The course breaks down the use of MPLS and discusses possible implementation strategies.

Prerequisites

A basic understanding of TCP/IP and some knowledge of IP routing, ATM (Asynchronous Transfer Mode) and Layer-2 switching would be advantageous.

Learning Objectives

At the end of this course, participants will be able to:
Understand the origins of MPLS
Understand MPLS standards
Describe the basic operation of MPLS
Describe the use of LDP (Label Distribution Protocol)
Differentiate between Cell Mode and Frame Mode MPLS
Understand the implementation of QoS with MPLS
Understand the principles of MPLS Traffic Engineering
Describe the formation of MPLS VPNs
Understand the issues with implementing MPLS

Who Should Attend

Network Engineers, Network Technicians and Technical Managers responsible for maintaining networks where MPLS has or will be implemented.

Course Outline

Introduction to MPLS
The Operation of MPLS
Routing Protocol Basics
Label Distribution Methods
Cell Mode vs Frame Mode
QoS with MPLS
Constraint-Based Routing
Traffic Engineering with MPLS
MPLS VPNs
MPLS Implementation

The key learning points from each topic will be revised at the end of each session. This will provide for the re-enforcement of techniques learned during course progresses.

Class Length

Two Days

Cost of the Course

See current course schedule

Wireless LAN Fundamentals

This course has been designed to provide an introduction to Wireless LAN Technologies and includes the basic operation and configuration of selected Cisco Aironet products.

This course is also a suitable pre-requisite for subsequent equipment related training..

Prerequisites

A basic knowledge of TCP/IP and Ethernet would be advantageous.

Learning Objectives

At the end of this course, participants will be able to:
Describe Wireless LAN Concepts.
Understand Health & Safety aspects of WLANs.
Understand the Operation of WLANs.
Configure Access Points, Client Adapters and Wireless Bridges.
Configure basic WLAN security features on selected Cisco Aironet products.
Troubleshoot basic WLAN problems.
Conduct a basic WLAN Site Survey.

Who Should Attend

Network Support Technicians, Administrators, Technical Managers and Support Staff who need basic theoretical and practical knowledge of Wireless LANs.

Course Outline

Wireless LAN Health and Safety issues.
Recap of Ethernet Technologies.
The operation of Layer-2 Bridges and Switches.
Wireless LAN Topologies and Terminology
The Operation of non-standard WLAN Devices (Repeater Access Points, Universal Clients, Wireless Bridges).
Basic WLAN Security.
Configure the following Cisco Aironet devices (1100/1200 Access Points, 350 Wireless Bridge, Client Adapters).
Conduct a simple WLAN Site Survey.

The key learning points from each topic will be applied to classroom activities at the end of the session. This will provide for the re-enforcement of techniques learned as the course progresses.
The class contains numerous practical examples, with a chance to gain hands on experience Cisco Aironet products.

Class Length

Two days

Cost of the Course

See current course schedule

CWDM / DWDM Equipment Training

We have the capability to deliver a range of Coarse Wavelength Division Multiplexing (CWDM) and Dense Wavelength Division Multiplexing (DWDM) equipment training courses, which would be tailored to meet the customer requirements. The equipment includes:

Transmode series 1100 (CWDM)

Marconi PMM

Prerequisites

This will be dependent on the level of course, knowledge of CWDM/DWDM is an advantage for all courses.

Learning Objectives

At the end of this course, participants will have covered the following:
Safety considerations when working with lasers and fibre optic systems.
Principles of CWDM/DWDM utilisation.
Description of individual card type and function.
Power and fibre interface connection.
Installation.
Operations and Maintenance.
Local terminal connection and operation.

Who Should Attend

Project managers and team members that manage and work on CWDM/DWDM equipment projects.

Technical Managers that manage technicians and engineers that work with CWDM/DWDM equipment

Engineers and Technicians that work with or maintain CWDM/DWDM equipment.

Administration or Support staff who work within a Wave Division Multiplexer based environment.

Course Outline

Why CWDM/DWDM?
Considerations when working with optical systems.
The importance of fibre cleanliness in CWDM/DWDM systems.
A breakdown of the different chassis options
Individual cards and their function
Fibre and power connection focusing on possible configurations.
Recommended rack installation, power and cooling requirements.
Operations and Maintenance considerations
Connect to the equipment with local terminal software.

The key learning points from each topic will be applied to classroom activities at the end of the session. This will provide for the re-enforcement of techniques learned during course progresses.

The class contains numerous exercises.

Class Length

One to five days, depending on the customers exact requirements

Cost of the Course

This will depend on the duration of the course, location etc.

The Fundamentals of Fibre Optics

This course introduces the fundamental principles and techniques underlying fibreoptic systems. It covers fibre and laser safety, fibre types and how they operate, connectorisation, fibre cleanliness and the principles of fibre testing. It is a suitable platform for all engineers, technicians and technical managers involved in design, installation, maintenance and management of modern Telecoms networks.

This course is also a suitable pre-requisite for subsequent equipment related training..

Prerequisites

None, this course provides a basic overview of fibre optics

Learning Objectives

At the end of this course, participants will have covered the following:
Principles of communications utilising Fibre Optic Cables.
Safety considerations when working with lasers and fibre optic cables.
Identification of different types of fibres and relevant roles.
Identification of different connections and the losses incurred.
Fibre cleanliness

Who Should Attend

Project managers and team members that manage and work on fibre projects
Technical Managers that manage technicians and engineers that work with fibre
Engineers and Technicians that work with or come in to contact with fibre.
Administration or Support staff who work within a fibre based environment

Course Outline

What is Fibre?
The Principles of Light Propogation
The Light Spectrum
Different Fibre Types and their roles
Types of Testing which can be carried out on fibre
Considerations which should be made when working with Fibre and Optical systems
The importance of fibre cleanliness in optical systems
Methods of cleaning fibre connectors and Optical ports
Example of the use of different fibre connectors and their roles
The main threats to optical systems

The key learning points from each topic will be applied to classroom activities at the end of the session. This will provide for the re-enforcement of techniques learned during course progresses.
The class contains numerous practical examples, with a chance to gain hands on experience with fibre cleaning.

Class Length

Two days

Cost of the Course

See current course schedule

SDH Equipment Training

We have the capability to deliver a range of SDH equipment training course, which would be tailored to meet the customer requirements. The equipment includes:

Marconi C-Mux II

Marconi SMA 1.1d

Marconi SMA Series 3 Products

Marconi Series 4

Marconi VCTS/Extender II

eci Sycom and XDM

Synchronisation equipment

Nortel TN-4Xe/16Xe

Prerequisites

This will be dependent on the level of course, knowledge of SDH is an advantage for all courses.

Learning Objectives

At the end of this course, participants will have covered the following (dependant upon customer requirement):
Safety considerations when working with lasers and fibre optic systems.
Fibre cleanliness.
Principles of data flow around multiplexer equipment.
Description of individual card type and function.
Power, fibre and electrical interface connection.
Installation.
Commissioning requirements
Operations and Maintenance.
Local terminal connection and operation.
Synchronisation operation

Who Should Attend

Project managers and team members that manage and work on SDH equipment projects. ·Technical Managers that manage technicians and engineers that work with SDH equipment. Engineers and Technicians that work with or maintain SDH equipment. Administration or Support staff who work within a PDH/SDH based environment and require to know more about the equipment they support.

Course Outline

Considerations when working with optical systems
The importance of fibre cleanliness in optical systems
Examine the way in which customer traffic and data communication traffic flow round the SDH equipment.
A description of each individual card, looking at the impact on its removal on traffic flow.
Traffic protection schemes available, and how they are utilised
Recommended rack installation layout, including power fibre and electrical connection.
Operations and Maintenance, discussing common faults.
Fault finding with practical exercises and testing.
Connection and configuration of the equipment using local terminal software
The operation of synchronisation around the multiplexer and how it is connected.

The key learning points from each topic will be applied to classroom activities at the end of the session. This will provide for the re-enforcement of techniques learned during course progresses.

The class contains numerous practical exercises.

Class Length

Three to five days, dependant on the content and customers requirements.

Cost of Course

This will depend on the duration of the course, location etc.

The Fundamentals of SDH

This course provides an understanding of SDH and how the modern transport network works. The course is tailored for those who require in-depth technical knowledge and an appreciation of SDH equipment and their applications in Telecommunication Networks.

Prerequisites

This course is designed for Telecommunication Engineers who already possess knowledge of the fundamental of Telecommunications

Learning Objectives

At the end of this course, participants will be able to relate to:
The evolvement of SDH.
SDH Terminology.
SDH Network Structures.
SDH Signals and Framing Structures
The Advantages of SDH including Pointers and Justifications
Traffic Protection Options
The Synchronisation of SDH Network Elements

Who Should Attend

·Project managers and team members that require in depth SDH technical knowledge
Technical Managers that manage technicians and engineers that work with SDH elements.
Telecommunication Technicians and Engineers managers involved in the design/installation/maintenance/ management of modern telecom networks.

The course is also a suitable pre-requisite for subsequent equipment related training

Course Outline

Transmission Principles
Pulse Code Modulation
To appreciate the limitations of PDH.
SONET, the origins of SDH?
To appreciate the improvements and enhancements SDH delivers.
To gain a basic understanding of SDH equipment.
To understand the SDH multiplexing structure.
Path Overheads
Section Overheads
Concatenation
Pointers
Protection Options
Synchronisation
An Outline of SDH Management.
Examples of Manufacturer specific Network Elements
Applications and SDH Networks are illustrated throughout the course

The key learning points from each topic will be revised at the end of each session. This will provide for the re-enforcement of techniques learned during course progresses.

Class Length

Two days

Cost of the Course

On Application.

TCP/IP— A Practical Foundation

This Hands On TCP/IP training course introduces the basic fundamentals of the Internet Protocols suite and utilises a number of hands-on exercises to allow delegates to develop practical skills. Delegates will be introduced to the function and workings of core TCP/IP suite protocols and will also build a functioning classroom network with hubs, switches routers and server applications.
The Internet Protocol Suite, commonly known as TCP/IP, forms the basis for the Internet and the next generation of telecommunications services. Not only is it being used for pure data services such as Electronic Mail and Web-Based services but it is now also used as the core for mobile phone networks and Next Generation Services.
It is now important for engineers and technicians to understand how the core protocols function and interact with each other in order to configure and troubleshoot modern computer networks.

Prerequisites

Delegates are expected to have a basic understanding of PC principles.

Learning Objectives

On completion of this course delegates will be able to:

- Use a protocol analyser to identify and troubleshoot the core Internet Protocols.
- Configure IP Addresses and identify IP Address problems
- Troubleshoot IP configuration problems
- Build networks using Hubs, Switches and Routers
- Troubleshoot TCP/IP networks with ICMP, ping and other PC utilities
- Configure and exploit FTP and TELNET
- Perform detailed protocol FTP, TFTP and Telnet sessions
- Understand the management of an Intranet through the use of SNMP

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a working knowledge of TCP/IP Protocols.

Course Outline

Introduction to TCP/IP Networking
- What is TCP/IP
- TCP/IP and the Internet
- Request for Comments
- TCP/IP Protocol Suite
- TCP/IP – A Layered Model
- TCP/IP layering and encapsulation
- Network Components and Devices
- Protocol Analysis

The Internet Protocol (IP)
- What is an Internetwork
- What do we Need to Build a Network
- IP addressing and address classes
- IP Protocol Header
- Address Mapping and Resolution
- Address Resolution Protocol
- Automatic Addresses Allocation with BOOTP and DHCP

Course Content

Building an Intranet
- Providing and Implementing an IP Addressing Scheme
- Lets put our IP Network together
- Global IP Addresses
- The use of Private IP Addresses
- IPv6
- How is IP Implemented on different Physical Networks
- IP on non-Ethernet LANs: SNAP and LLC
- Using IP on WANs
- IP used on Frame Relay AND ATM

Internetworking with IP Routers
- What is a Routed Network?
- What is the Primary Function of a Router
- Interior Gateway Routing Protocols – RIP and OSPF
- Exterior Gateway Routing Protocols - BGP
- Working with Routers and Troubleshooting Issues
- Intranets and the Internet
- Dividing our Network into Logical Sub Networks
- Management of IP with ICMP
- Supernetting
- Classless Inter-Domain Routing (CIDR)
- Network Address Translation (NAT)

The Transport Layer
- TCP/IP Transport Layer Protocols: TCP and UDP
- What is the Function of the Transport Layer
- The role of the transport protocol
- Connection-Orientated vs Connectionless protocols
- Transmission Control Protocol in Detail
- Reliable Data Communications with TCP
- Port Numbers and Sockets
- TCP packet structure and troubleshooting
- TCP performance issues
- User Datagram Protocol in Detail
- Connectionless protocol operation
- Providing reliability at the Application Layer
- Applications and Management Protocols

Applications
- TCP/IP Applications
- What do we mean by the Client/Server Model?
- What do we mean by the Peer-to-peer Model?
- File transfer protocols - FTP
- Trivial File Transfer Protocol - TFTP
- Remote Configuration and Management with Telnet
- The Domain Name Service (DNS)
- SMTP, the basis of Internet mail
- Utilising workstation mail: POP3, IMAP4
- The basics of Voice over Internet Protocol - VoIP
- SIP – Session Initiation Protocol
- TCP/IP for Windows XP, Windows 7 and UNIX

Course Content

- Exploring Internet Services
- Permanent direct connection
- Dial Services with PPP, PPPoE and PPPoA
- What is a VPN?
- Internet Service tools
- Retrieving files using Anonymous FTP
- Using World Wide Web (WWW) tools

Managing TCP/IP Networks

- What is SNMP?
- Simple Network Management Protocol (SNMP)
- The management database: MIB
- SNMP evolution: MIB I and II, RMON, SNMPv2, SNMPv3
- Community Strings

Hands-on Exercises (over duration of course)

- Analyze TCP/IP Protocols using a Network Protocol Analyzer
- Set up FTP Services
- Use Telnet Services
- Undertake detailed analysis of IP, TCP, FTP, Telnet and other applications
- Configure a PC to use TCP/IP
- Set up a Routed Network with the Correct IP Addressing Scheme
- Configure basic routing services on a Router
- Make and analyze Voice over IP Calls
- Troubleshooting basic network routing problems

Class Length

Four days

Broadband Technologies

The course focuses on theoretical principles of xDSL Technologies, looking at the various implementations of xDSL, the physical architecture needed to deliver xDSL and the equipment and protocols that are needed to service an xDSL environment.

Aim: To provide delegates with a fundamental understanding of xDSL, and the protocols and standards associated with it as well as the physical components of xDSL networks. In addition, other technologies such as Cable, WiFi, Wi-max and others are discussed.

Prerequisites

There is no prerequisite knowledge needed, but a general awareness of communications systems would be helpful.

Learning Objectives

On completion of this course delegates will be able to:

Understand Basic Telephony.
Understand Telephone Network Architecture.
Describe Digital Transmission Technology.
Understand ISDN Basics.
Describe DSL Family variations such as HDSL, SDSL, ADSL, VDSL.
Have an appreciation of alternative Broadband Technologies.
Describe End User Equipment and Protocols.
Have an appreciation of Cable Services
Have an appreciation of Wireless Broadband Services

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a knowledge of Broadband.

Course Outline

Recap on Telephone Technology
How a simple telephone works
The Analogue Local Loop
Analogue Telephone Transmission
The Evolution of Telephone Switching
The Public Switched Telephone Network
Multiplexing
The Street Cabinet
Dial up Access
Narrowband ISDN
Broadband ISDN
ISDN Architecture
BRI and PRI
ISDN Reference Point
Digital Transmission Technology
Line Coding
QAM – Quadrature Amplitude Modulation
CAP – Carrierless Amplitude with Phase
DMT – Discrete Multitone
Error Detection and Correction
Protocol Adaptation
Transmission Medium Limitations

Course Content

Frequency Responsee
Crosstalk
Bridge Tap Reflections
Audio Coil Loading

Introduction to xDSL
Where did it all begin?
HDSL
SDSL
ADSL
RADSL
CDSL
VDSL

Alternative Broadband Technologies
CATV Systems
First Generation One Way Modems
HFC – Hybrid Fibre Coax
Wireless Cable Systems
WLL – Wireless Local Loop
Wimax
WiFi
IBSS
BSS
ESS
Wireless Bridges
WiFi Security
Fibre Systems

End User DSL Equipment and Protocols
DSL End User Devices
Modems
Microfilter
Cable Modems
Residential Gateway / Router
ADSL Modem / Router Protocols
ATM – Asynchronous Transfer Mode
NAT – Network Address Translation
DHCP – Dynamic Host Configuration Protocol

Subscriber Information
Broadband Aggregation Introduction
CPE – Customer Premises Equipment
NAP – Network Access Provider
Subscriber Termination
SLC Operation
Aggregation Devices
Typical ISP Network Topology
MPLS Overview (Brief)
NSP – Network Service Provider
Service Provider Retail Services
Service Provider Wholesale Services

Course Content

ATM Bridging and Routing Methods
PPP – Point to Point Protocol
Broadband Access Methods
PTA – PPP Termination Aggregation
L2TP – Layer 2 Tunnelling Protocol
AAA – Authentication, Authorisation and Accounting

Class Length

Two days

Networking and Systems

This 2-Day Overview on LAN / WAN Networking and Systems introduces the basic fundamentals of Networking with LANs and WANs and includes information on the key elements in a Modern Networking System. Delegates will be introduced to the function and workings of Modern Networks including an Introduction to Cloud Computing.

The Internet Protocol Suite, commonly known as TCP/IP, forms the basis for the Internet and the next generation of networking and telecommunications services. Not only is it being used for pure data services such as Electronic Mail and Web-Based services but it is now also used as the core for mobile phone networks and Next Generation Services.

It is now important for any staff involved in the transportation of data over networks to understand how the many hardware and software elements in a network interact and compliment each other in order to provide a secure environment for the storage and transportation of data.

Prerequisites

There is no prerequisite knowledge needed.

Learning Objectives

On completion of this course delegates will be able to:

Explain the function of a Data Network.
Differentiate between LAN and WAN services.
Have an appreciation of Secure Wireless Network Technology.
Understand the fundamentals of Client / Server Operation.
Understand the terms 'Thick and Thin Clients.
Have an appreciation of Remote Access Technologies (Risks and Mitigation).
Explain the purpose and function of a Firewall.
Have an appreciation Network Security Features.
Appreciate Hacking and its prevention
Understand the purpose of Cloud Networks.
Understand the basic of Storage Media and RAID Systems.
Describe Virtual Server Technology.
Explain the Term 'Blade Technology'.
Describe Backup Power Systems and Data Systems
Be familiar with some common Monitoring Tools.

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of Data Networking and Systems.

Course Content

Introduction to TCP/IP Networks
- What is LAN?
- Ethernet
- What is a WAN?
- What is a SAN?
- What is a WLAN?
- Common WAN Technologies
- TCP/IP Protocol Architecture (Brief)
- TCP/IP Networking Components

Introduction to Wireless Technologies and Security

Course Content

- How does a Wireless Network operate.
- What Wireless Standards are commonly in use?
- Wireless Security Standards
- WPA and WPA2
- TKIP and EAP

Client / Server Networking
- Client Server Model
- Comparison with Peer to Peer Networking
- Advantages of a Client Server Network
- Disadvantages of a Client Server Network

Thick and Thin Clients
- Thin Client Definition
- Thick Client Definition
- Advantages and Disadvantages

Remote Access Technologies
- Cable
- DSL
- VPNs
- SSL

Firewalls
- What is the purpose of a Firewall?
- Packet Filters
- Application Layer Firewalls
- Nat Functionality

Network Security Features
- Firewalls
- IDS
- Strong Authentication
- Antivirus
- Physical Security

Cloud Networks
- Overview
- Deployment
- Security

Storage Media and RAID Systems
- Tape Storage
- Disk Storage
- SAN (Storage Area Network)
- Blade Servers
- Virtual Servers
- RAID

Backup Power and Data Systems
- UPS
- Emergency Power Systems
- Live Data Backup

Monitoring Tools
- SNMP (Simple Network Management Protocol)
- HP Network Node Manager (NNMi)
- Cisco Works
- IBM Tivoli

Class Length

Two days

Introduction to Next Generation Networks

The term Next Generation Networks refers to networks being designed to deliver virtually any service including telephony, broadband data and multimedia services over a common infrastructure. For a number of years now telecommunications operators have been switching traditional circuit-switched voice services to IP networks, which are packet switched. In fact Internet Protocol will be the common denominator for all services. Underlying IP, it is proposed that Ethernet will be the data link layer standard, although SDH will play a part for a while yet. IP Core networks will and are being MPLS enabled to provide a Quality of Service link between Ethernet and IP.

Prerequisites

There is no prerequisite knowledge needed.

Learning Objectives

On completion of this course delegates will be able to:

Be aware of what a multi-service network is designed to deliver
Understand the common technologies used in the core, distribution and access layers
Have an appreciation of the architecture required to deliver multiple services over a single architecture.
Appreciate the benefits for both the provider and customer alike

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of Next Generation Networks.

Course Content

Introduction to Next Generation Networks

What is a Next Generation Network?
A single Architecture
VoIP and IP Telephony
What Services will these new networks carry?
How will the architecture differ?
Control and Access Protocols

Transmission
Ethernet Services (10, 100, Gigabit, 10 Gigabit)
Digital Subscriber Line
HDSL
SDSL
ADSL
ADSL2
ADSL2+
VDSL
Last Mile / First Mile
EFM – Ethernet First Mile
PON – Passive Optical Networks
EPON – Ethernet over PON

Course Content

IP Services

IP Version 4
IP Addressing
NAT – Network Address Translation
ARP – Address Resolution Protocol
DHCP – Dynamic Host Configuration Protocol
Multicasting
TCP – Transmission Control Protocol
UDP – User Datagram Protocol
IP Version 6 or IPng

IP Multicasting

Unicast and Multicast
Why Multicast?
Multicast Addressing
IGMP – Internet Group Management Protocol
QoS – Quality of Service
Best Effort
Integrated Services
Differentiated Services
IP Precedence
Diffserv
Queuing and Scheduling
VLANs and IEEE 802.1p/q

MPLS – Multi Protocol Labeled Switching

What is MPLS
MPLS Shim Labels
MPLS Operation

Real Time Media over IP

Review of traditional voice services
Codecs
Quality of Service
Video over IP
Voice over IP
H.323 Overview
Q.931

SIP - Session Initiation Protocol

What is SIP?
SIP URLs
SIP Registration
SIP Proxy Server

Course Content

SIP Redirect Server
SDP – Session Description Protocol
Basic SIP Messages
SIP Response Codes

IPTV

What is IPTV?
IPTV Streams
IGMP
Switched Digital Video
Video on Demand

Signalling and Control Protocols

H.248
Megaco
Media Gateways
Softswitches

Signalling and IP

Sigtran
Sigtran Protocol Architecture
SCTP – Stream Control Protocol
SCTP vs TCP
M2PA
M2UA
M3UA

Class Length

Two days

Introduction to Telecommunications

This course focuses on the fundamentals of telecommunications and describes the evolution of telecommunications, advancements in telecommunications technologies and takes a brief look at the future of telecommunications.
The invention of the telegraph in support of the railways in the United States heralded the start of telecommunications, and was a revolutionary concept at the time. Alexander Graham Bell couldn't have known how his simple invention would have such a profound impact on the World we live in. The actual basic telecommunications architecture hasn't changed since the early days, with the need for simple endpoints (telephones), a means of local signalling, centralized control and call management and of course a transmission medium. Finally the Cell Phone gave us the mobility and ability to communicate from almost anywhere through the use of wireless technologies.

Prerequisites

There is no prerequisite knowledge needed.

Learning Objectives

On completion of this course delegates will be able to:

Understand how technology has driven the telecommunications industry.
Understand the key technologies deployed within most telecoms networks globally.
Understand the basic building blocks of telecommunications networks.
Have an appreciation of how telecommunications networks are evolving to keep pace with customer demand.

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of Next Generation Networks.

Course Content

Introduction to Basic Telephony
Public Telecoms Networks
The Birth of Telephony
Strowger
A Network is?

Switching and Transmission
What is a Switch
Switch Types
Exchange Services
Exchanges
Transmission Lines
Dedicated and Switched Lines
Leased Lines

Signalling
Switching and Signalling Networks
Call Reference Model
Anatomy of a Voice Call
Cell Sequences
Evolution of the Market
Telecoms Standards

Transmission
Analogue and Digital Lines

Course Content

Errors
Bits, Bytes, Hertz and Wavelength
Optical and Radio Channels
Scales and Ranges
Full and Half Duplex
Connection Orientated Communications
Connectionless Communications
Modems and Codecs
Voice Characteristics

Turning Voice into Data
The Encoding Process
Analogue to Digital and Digital to Analogue
Transmission Lines
Multiplexing
Primary Rate Multiplexing (PDH)
Time Division Multiplexing
European Multiplexing
PDH – Plesiochronous Digital Hierarchy
SDH – Synchronous Digital Hierarchy
SDH Operation
SDH Frame Format
So what is SONET?
Statistical Multiplexing
Frequency Division Multiplexing

Why Fibre Optics?
Fibre Optic Basic Operation
Single mode vs Multimode Fibre
Different Frequencies behave differently
Getting More out of Fibre
WDM – Wavelength Division Multiplexing
CWDM – Coarse Wavelength Division Multiplexing
DWDM – Dense Wavelength Division Multiplexing

Signalling
Digital Switching
Signalling
Signalling Requirements
Types of Traditional Signalling
Local Loop Signalling
Tone Dialling Telephones
Local Telephone Signalling
QSIG and DPNSS
DSS1
ISDN Signalling is Q.931
Signalling System 7

Non-Intelligent Network
What is an Intelligent Network
IN Physical Architecture
Call Centres

Course Content

VPNs

Digital Subscriber Line
ISDN – Integrated Services Digital Network
The end of the Analogue Core
ISDN Formats
Use of ISDN
Broadband ISDN
DSL Timelines
Basic xDSL System
xDSL Family
Broadband Aggregation Introduction
HDSL – High Speed Digital Subscriber Line
SDSL – Synchronous Digital Subscriber Line
ADSL
RADSL
Service Provider Retail Service
Service Provider Wholesale Service
VDSL
FTTC and FTTH
DSL Comparison
Cable Modems
CATV
Electricity Cables
WLL – Wireless Local Loop

NGN and VoIP
Next Generation Networks
Why Voice over IP?
VoIP Patterns of Use
VoIP Usage Aspects
VoIP – The Protocols
Voice Compression
Standards and Framework
SIP – Session Initiation Protocol
SIP Components
NGN Benefits
Traditional Telephone Systems
SoftSwitch Solution
Multicasting

Telecoms Major Players
UK Carriers
Telecoms Equipment Vendors
Systems Integration
Triple-Play Service Providers

Class Length

One day (2 and 3 day versions of this course are also available on request)

Data Networking and Architecture

The course focuses on theoretical principles and practical implementation of selected Data Networking protocols and standards. Physical network architecture is described as well as some of the configuration techniques used to achieve the goals. Some of the Core Network Protocols in this course are aimed at those working in a Service Provider or Carrier environment.

Prerequisites

Some knowledge of Data Networking and Telecommunications is assumed.

Learning Objectives

On completion of this course delegates will be able to:

Be aware of what a multi-service network is designed to deliver
Understand the common technologies used in the core, distribution and access layers
Have an appreciation of the architecture required to deliver multiple services over a single architecture.
Appreciate the benefits for both the provider and customer alike

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of Carrier Data Networking

Course Content

Understand Ethernet Technologies and Concepts.
Describe Layer 2 and Layer 3 switching.
Describe the basic function of Routing with Interior Gateway Routing Protocols, OSPF and IS-IS.
Describe the basic function and operation of BGP.
Describe a VLAN and its purpose and function.
Understand the Technologies behind VPNs.
Describe VPLS (Virtual Private LAN Service and VPWS (Virtual Private Wire Service).
Describe the purpose and function of an Emulated LAN
Describe the function of LACP (Link Aggregation Control Protocol)
Understand the principles of MPLS (Multi Protocol Labelled Switching)
Describe TMPLS and the use of Pseudowires.
Compare and contrast TMPLS with PBB-TE (Provider Backbone Bridging-Traffic Engineering.
Understand IP Multicast
Describe the function and purpose of DHCP (Dynamic Host Configuration Protocol).
Describe the use of VoIP (Voice over Internet Protocol), the drivers behind it and the numerous protocols associated with it.

Class Length

Four days

The Evolution of Ethernet

This 4-day course enables delegates to construct a complete service in the classroom using a variety of network equipment. The course contains Hands On labs for implementation, troubleshooting and quality of service.

Ethernet is the most widely-installed LAN technology. Specified in a standard, IEEE 802.3, Ethernet was originally developed by Xerox and then developed further by Xerox, DEC, and Intel. The most commonly installed Ethernet systems are 10BASE-T and provide transmission speeds up to 10 Mbps.

Fast Ethernet or 100BASE-T provides transmission speeds up to 100 megabits per second and is typically used for LAN backbone systems, supporting workstations with 10BASE-T cards. Gigabit Ethernet provides an even higher level of backbone support at 1000 megabits per second.

Prerequisites

Some prior knowledge of Data Networking could be advantageous.

Learning Objectives

On completion of this course delegates will be able to:

The Origins of Ethernet
Ethernet Media Access Control
Ethernet Cabling
Ethernet Framing
From 10Mbps to 100Mbps
Designing Ethernet Networks
Performance Enhancement
Ethernet Bridging
Introduction to Ethernet Switching
Advanced Spanning-Tree and Trunking Features
Introduction to VLANs
Gigabit and 10 Gigabit Ethernet

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of Data Networking with Ethernet.

Course Content

In the beginning – Arpanet
RFC – Request for Comments
Internetworking Development 1960s & 1970s
Internetworking Development 1980s
Internetworking Development 1990s
Internetworking Development 2000s
OSI – 7 Layer Reference Model
DOD Reference – 4 Layer Model (TCP/IP)
Aloha Radio System
Original Ethernet
10 Mbps Standard
StarLan
IEEE 802.3

CSMA/CD

Course Content

Collisions
Ethernet MAC
Ethernet Errors
Ethernet Cabling
Ethernet Standards (10base2, 10Base5)
Twisted Pair Cable
UTP Wiring
Fibre Optic Cable
Wireless – IEEE 802.11
Wireless Modulation and Channels
WLAN Topologies (IBSS, BSS, ESS)
CSMA/CA

Ethernet Framing (Ethernet II and IEEE 802.3)
Locally Administered MAC Address
Logical Link Control

From 10Mbps to 100Mbps
100BaseX
MII – Media Independent Interface
4B5B Encoding (Brief)
100BaseTX Physical Layer
100BaseT4 Physical Layer
100BaseFX Physical Layer
SC Connectors
ST Connectors
MIC Connectors
Fast Ethernet Development
EIA/TIA Wiring

3 Layer Hierarchical Model
SME Hierarchical Model
Switched Hierarchical Model
Router Hierarchical Model
Mesh Topologies
Types of LAN
Ethernet Diameter
Repeaters
Hubs
Autonegotiation

Techniques for improving LAN Performance
Category 5 Cable
Category 5e Cable
Category 6 Cable
1000BaseX
Multiple Rate Ethernet Networks
Link Aggregation
Network Management
SNMP

Ethernet Bridges

Course Content

Address Learning
Local and Remote Bridges
Flow Control in Bridges

Switched Networks
Address Learning
Broadcast and Multicast Frames
Redundancy
Spanning Tree
Switching Modes
Duplex and Speed

Cisco Switch Configuration
Working with MAC Address Tables
Port Security
Fast EtherChannel
Rapid Spanning Tree

VLANs
VLAN Membership
VLAN Standards
VLAN Tagging
VTP
VLAN Configuration

Gigabit Ethernet Overview
IEEE 802.3z
Gigabit Ethernet Physical Layer
1000BaseT
10 Gigabit Ethernet
10 Gigabit Ethernet in thee Metro Network

Class Length

Four days

Cisco Networking Part 1 (ICND1 Equivalent)

The course focuses on theoretical principles and practical implementation of Data Networking with Cisco Routers and Switches.

Prerequisites

Some prior knowledge of Data Networking or TCP/IP could be advantageous.

Learning Objectives

On completion of this course delegates will be able to:
Have an Understanding of Networking Fundamental Principles
Have an Understanding of OSI / TCP/IP Models, Ethernet and WANs
Understand Ethernet LANs and the use of Hubs, Bridges and Switches
Perform Installation and Configuration of Ethernet Switches
Understand, Configure and Troubleshoot VLANs
Understand Basic Spanning Tree Concepts and Implementation
Have an Understanding of IPv4 Addressing, Masks and Subnetting
Perform IPv4 Configuration of Cisco Routers and Routing
Understand Routing with Interior Gateway Routing Protocols
Configure a Router for Single OSPFv2 Operation
Understand IPv4 Host Connectivity and Troubleshooting
Design and Implement Networks with Subnets
Perform VLSM (Variable Length Subnet Masking)
Understand Route Summarization
Understand the Operation and Configuration of Standard and Extended ACLs
Perform basic Router and Switch Security
Understand and Configure Network Address Translation Services
Understand IPv6 Protocols and Addresses
Implement IPv6 on Routers
Implement IPv6 Routing including Static and Dynamic Routes
Configure Single Area OSPFv3

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a practical knowledge of networking with TCP/IP using Cisco Routers and Switches, and who may wish to sit the ICND1 Certification exam.

Cisco Networking Part 2 (ICND2 Equivalent)

The course focuses on theoretical principles and practical implementation of Data Networking with Cisco Routers and Switches, and follows on from Cisco Networking Part 1.

It is assumed that delegates have some basic knowledge of Cisco IOS and data networking principles. This course forms the second part of two courses designed to provide the skills and knowledge at a level equivalent to Cisco CCNA. This course provides delegates with a basic, practical and theoretical understanding of Cisco Internetworking Devices, Configuration and Troubleshooting to a level similar to that of Cisco ICND2 and CCNA. Delegates who absorb the knowledge and assimilate the skills should have a reasonable chance of passing the Vendor exams needed to achieve certification.

Prerequisites

Some prior knowledge of Data Networking or TCP/IP could be advantageous.

Learning Objectives

Have an Understanding of Spanning Tree Protocol
Configure Spanning Tree Features and Options
Understand Local Area Networks and Troubleshoot LAN Problems
Understand and Troubleshoot Layer 3 Problems
Understand and Configure Redundant Routers
Have an Understanding of VPNs
Configure GRE Tunnels
Configure and Troubleshoot OSPFv2 Routing Protocol
Understand the Operation of EIGRP
Configure EIGRP for IPv4
Troubleshoot Routing Protocols
Configure Point-to-Point WAN Configurations
Understand Frame Relay Network Operation
Configure Frame Relay
Understand Routing with IPv6
Configure and Verify OSPFv3
Configure and Verify EIGRP for IPv6
Understand Network Management Basics
Understand Router and Switch File Management
Understand IOS Licensing

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a practical knowledge of networking with TCP/IP using Cisco Routers and Switches, and who may wish to sit the ICND2 Certification exam.

IPv6 Overview

The course focuses on theoretical principles and basic practical implementation of IPv6 (Internet Protocol version 6). The differences between IPv4 and IPv6 are highlighted, as are the benefits of switching to IPv6.

Prerequisites

Some prior knowledge of Data Networking using IPv4 could be advantageous.

Learning Objectives

Understand the IPv6 protocols
Contrast the IPv4 and IPv6 addressing scheme
Be able to understand basic IPv6 features
Understand the composition of the IPv6 Header
Understand the IPv6 Address Types and use of the IPv6 Prefix
Understand the Unique Local Unicast Address
Understand IPv6 Subnetting
Be introduced to IPv6 Routing Protocols
Understand IPv6 Host Configuration and Connectivity
Understand the options for IPv6 Host Configuration such as NDP, SLAAC and DHCP

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic knowledge of IPv6 Protocols.

Practical Introduction to IPv6

The course focuses on practical aspects and implementation of IPv6 (Internet Protocol version 6). Delegates will learn the basic practical configuration of IPv6 using Cisco switches and routers.

Prerequisites

Some prior knowledge of Data Networking with IPv4 could be advantageous.

Learning Objectives

Understand the IPv6 Protocols and Operation
Understand the IPv6 Address Types and use of the IPv6 Prefix
Understand the Unique Local Unicast Address
Understand IPv6 Subnetting
Be introduced to IPv6 Routing Protocols
Understand IPv6 Host Configuration and Connectivity
Understand the options for IPv6 Host Configuration such as NDP, SLAAC and DHCP
Configure Static IPv6 Addresses
Understand the use of the EUI-64 Interface Identifier
Verify IPv6 interfaces on Cisco routers
Verify IPv6 routes on Cisco routers
Manually configure the IPv6 Link Local Address on Cisco routers
Identify Local and Connected IPv6 routes
Configure and verify Static IPv6 routes
Configure and verify Default IPv6 routes
Configure, verify and troubleshoot OSPFv3 routing

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic practical knowledge of networking with IPv6.

Next Generation Optical Networks

This workshop allows the delegate to fully understand Next Generation Networks from access to core. The instructor led training encompasses practical training sessions, whereby the delegate will get to build NGN networks.

Prerequisites

Some prior knowledge of Data Networking with IPv4 could be advantageous.

Learning Objectives

List the different types of fibres and standards.
- Know the importance of fibre cleanliness in modern optical transmission networks.
- Demonstrate fibre safety when handling fibre and laser safety.
- Understand the flexibility of offering traditional TDM services and Ethernet Data services in a Next Generation Network.
- Know how Ethernet services operate and are transported in Next Generation Networks.
- Describe technically how WDM networks work.
- Explain and demonstrate planning considerations for Optical Networks.
- Classify the difference between CWDM and DWDM networks.
- Stipulate the need for amplification in optical networks and its drawbacks.
- Know how optical protection and management operates in core networks.
- Design, build and test NGN access network, Metro Network and DWDM core network.

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic working knowledge of Next Generation Networks.

Course Content

Fibre

- Different Fibre Types.
- Fibre Cleaning
- Fibre Safety

Next Generation Access

- PDH Access
- SDH Access
- Next Generation Ethernet over SDH
- Layer two Packet Intelligence
- Next Generation Access Networks

Optical Transmission Networks

- WDM Principles
- Effects of Light within Fibre
- Planning Considerations.

Metro Transmission Networks

- Coarse Wavelength Division Multiplexing
- Optical Amplifiers

Course Content

- CWDM Networks

Optical Core Networks

- DWDM Introduction
- Digital Wrapper G.709
- DWDM

Protection

- DWDM Management
- DWDM Core Networks

Practical Exercises

1.Design and build a NGN access network with services.
2.Design and build a Metro CWDM network.
3.Design and build a DWDM Core Network.

Class Length

Three days

Introduction to Cisco IOS

This 3-Day Course introduces Cisco IOS (Internetwork Operating System). Delegates will learn the basic features and functions and complete practical exercises using Cisco Routers and Switches.

Delegates will learn the Cisco IOS structure and practice the use of management commands as well as those associated with global router and switch parameters such as IP addressing, MAC Address management, LAN and WAN services and security configuration such as Access Control Lists (ACLs) on routers and Port Security on switches.

It is not always necessary for staff to complete a full Cisco Certification course such as an CCNA when they are only performing limited tasks on Cisco routers and switches. This course will provide the basic skills to be able to configure, monitor and maintain small to medium sized routers and switches.

Prerequisites

Some prior knowledge of Data Networking with IPv4 could be advantageous.

Learning Objectives

Make a physical connection to the Catalyst Switch and Router Console port.
Provide the switch and router with the appropriate Password Protection.
Understand Catalyst Switch startup procedures.
Understand the makeup of MAC Address Tables.
Configure basic Port Security on a 2950 / 2960 Catalyst Switch.
Configure FastEtherchannel Trunks.
Configure Speed and Duplex settings.
Understand the principles of a Virtual Local Area Network (VLAN).
Configure a Cisco 2950 / 2960 Catalyst switch for static VLAN operation.
Configure IEEE 802.1q VLAN Trunks.
Configure a Cisco Router for LAN and WAN services
Managing configuration files and IOS images.
Configuring and managing RIPv1
Configuring and managing RIPv2
Configuring single area OSPF.
Configuring multiple area OSPF.
Configuring EIGRP.

Who Should Attend

·Engineers, Technicians, Technical staff and managers who require a basic practical knowledge of networking with Cisco Routers and Switches.

SDH Overview

This course provides an overview of SDH and how the modern transport network works.
The course is tailored for those who do not require in-depth technical knowledge, but a basic understanding of SDH.

Prerequisites

No prior knowledge is assumed.

Learning Objectives

To appreciate the limitations of PDH
SONET, the origins of SDH?
To appreciate the improvements and enhancements SDH delivers.
To gain a basic understanding of SDH equipment.
To understand the SDH multiplexing structure.
An outline of SDH management.
Examples of manufacturer specific Network Elements.
Applications and SDH Networks are illustrated throughout the course.

Who Should Attend

·Project managers and team members that manage and work on SDH projects.

Technical managers that manage technicians and engineers who work with SDH.
Administration or Support staff who work within an SDH based environment.

Class Length

Two days

Voice over IP with SIP

This course focuses on theoretical and practical principles of Real-Time Media over Internet Protocol coupled with SIP (Session Initiation Protocol). Although the course is intended to be generic, examples of VoIP networks are highlighted utilising Cisco products and other vendor software and hardware.

Prerequisites

Some prior knowledge of TCP/IP or Telecommunications would be beneficial

Learning Objectives

Understand how VoIP and it's associated protocols fit in with the existing networking protocol models.
Be able to explain the reasons for the use of VoIP.
Describe the potential benefits of VoIP
Understand voice quality issues associated with VoIP
State the additional protocols that make VoIP possible
Understand the differences between H.323 and SIP
Understand Quality of Service (QoS) and what it means
Appreciate how IP Multicasting plays a part in Real-time media delivery
Understand the differences between Circuit Switches and Packet Switched Voice.
Configure a simple VoIP application on a windows PC and make Phone Calls
Set up a SIP Server for registration of Client Devices
Configure a SIP Converter or SIP Phone
Configure a SIP Server / IP PBX at multiple sites and make calls across a WAN.
Configure and test basic QoS parameters and Test Voice Quality.

Who Should Attend

·Engineers, Technicians, Support Staff who need a practical introduction to VoIP utilising Session Initiation Protocol.

Course Content

Introduction to VoIP
How it Works
VoIP – Encapsulation
VoIP – Associated Internet Protocols
VoIP – Service Providers
Networks
Why VoIP?
What does VoIP Offer?
The Business Case for VoIP
Internet Telephony Product Classes
Today's Voice and Data Networks
Integration
VoIP Regulatory Bodies

Voice Encoding Schemes
Waveform Encoding
Digital Recording and Playback
PAM – Pulse Amplitude Modulation
Quantization
Clipping
Vocoders
MOS – Mean Opinion Scores

Course Content

Voice Quality Measurement
Voice Quality Issues
Latency
Jitter
Packet Loss
Echo Problems in VoIP
Echo Suppression
Echo Cancellation

Protocols – Network and Transport Layers
OSI 7 Layer Model
Internet Protocol
IP Addressing
TCP – Transmission Control Protocol
Ports and Sockets
Windowing
UDP – User Datagram Protocol

Protocols – Data Link and Physical Layers
Data Link and Physical Layer in the LAN
Routed Networks
Switched Networks
Networks with VLANs
What is a VLAN?
VLAN Membership
VLAN Tagging
IEEE 802.1p/q Ethernet Frame Format
Data and Computer Networking
Frame-Relay
xDSL
Broadband Access
SONET and SDH
PPP – Point to Point Protocol
MTU Size
Fragmentation and Reassembly

VoIP Support Services
Configuring DHCP to support VoIP
Cisco DHCP Configuration Example
Option 150 and 66
DHCP Relay Agents
Cisco Router Relay Agent Configuration
NAT – Network Address Translation
NTP – Network Time Protocol
DNS Support for VoIP
STUN – Simple Traversal of UDP through NAT

Real Time Protocols
RTP – Real Time Transport Protocol
Encapsulation Overhead
Header Compression
RTP Translators

Course Content

Audio Conferencing (Mixers)
RTCP – Real Time Transport Control Protocol
RTCP Bandwidth Control
RTCP Reports

VoIP Security
Security Implications
Eavesdropping
Spoofing
Interception
Countermeasures
Physical and Logical Security
VoIP and Firewalls

VoIP Bandwidth
Traditional Call Activity
Trunk Activity
Erlangs
Blocking
Voice Quality Delivery Options
Configuring End-to-End QoS

H.323 Networks
Brief Description for comparison with SIP

SIP – Session Initiation Protocol
SIP Protocol Stack
SIP Topology
SIP Operation
SIP URLs
SIP Signalling Messages
Typical SIP Transaction
SIP Message Format
SIP Cseq
SDP – Session Description Protocol
SIP Servers
SIP Registrar
SIP Proxy
SIP Redirect

SIP Trunking
What is VoIP Trunking
Traditional vs New
Carrier Class SIP Trunking
SIP and PSTN Internetworking
SIP and ISUP
SIP Telephony and ISUP Tunnelling
Enhanced Telephony Services
SIP Example Call Traces

Cisco VoIP Example (Brief)
Cisco IP Telephony Components

Course Content

Cisco CallManager
SRST – Survivable Remote Site Telephony
Cisco Unified CallManager

QoS – Quality of Service
Quality and Delivery Options
Congestion Control
Quality of Service Models
Best Effort
Integrated Services
RSVP
Differentiated Services
Congestion Management
FIFO
Priority Queuing
Custom Queuing
Low Latency Queuing
Weighted Fair Queuing
Delivering QoS in the core network
MPLS Overview (Brief)
CAC – Call Admission Control
WRED – Weighted Random Early Detection

VoIP Phone / Adapter and IP PBX Configuration

Class Length

Three days

Beginners Introduction to Networking

This course is designed to provide delegates with a basic, practical understanding of Networking Principles through the use of networking devices such as Routers, Ethernet Switches, Hubs and Workstations.

Prerequisites

None, this course provides a fundamental theoretical and practical introduction to TCP/IP networks.

Learning Objectives

Determine the appropriate use for the following internetworking devices (Hubs, Ethernet Switches, Routers, Workstations.
Manipulate Cisco IOS software through the Command Line Interface to configure and verify interfaces, various protocols and connections.
Interconnect and configure Cisco routers and Catalyst Layer 2/3 Switches as part of a Network, to support specific LAN application services and WAN services.
Use IP Addressing and perform network segmentation through the use of subnetting with the purpose of providing an efficient and effective working network.
Build an internetwork and test the network by running application layer services across the physical and logical structure.
Troubleshoot network elements and infrastructure using structured troubleshooting methodology

Who Should Attend

Anyone who requires a basic practical understanding of data networks running TCP/IP

Class Length

Four days

Cost of the Course

See current course schedule

Courses under Development:

VPN Overview
Routing with BGP

Contact Us

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NST
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