



Training & Consultancy



*Professional
Services
Portfolio*



Training

Consultancy

Technology

Products

Voice

Data

Mobile

Internet



Company Overview

Who Are We?

Founded in 2001, MAX Training is a Vendor Independent, Technical Training Company working throughout our industry.

Our independence allows us to be unbiased, factual and objective.

We offer Product Specific or Generic Technology and Sales Training to Service Providers, Product Vendors, Public Utilities, Governmental Organisations and Large Corporate Clients.

We combine cutting edge Training and Consultancy with "old world" business values. We exist to service your training needs and wish to foster strong business relationships built on trust, competence and value.

How Do We Work?

Our approach is to listen to you → help you to identify your needs → work with you to develop courseware around your requirements → present a course for you which is 100% relevant to your needs

- MAXimise your training budget*
- MAXimise your internal resources*
- MAXimise the return on your training investment*

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Company Philosophy

MAX Training Ltd strives to adopt a holistic approach to technical education.

- ❑ We take an interest in each delegate, seeing each individual as having unique educational needs.
- ❑ We seek to foster an environment conducive to learning, in which delegates feel comfortable, unintimidated and involved.
- ❑ We aim to provide a positive learning experience irrespective of cultural extraction, command of the English language, or limit of technical understanding.

Reputation is everything at MAX Training.

- ❑ We strive to develop a name throughout the Communications Industry synonymous with flexibility, quality, value and competence.





Professional Services Portfolio

MAX Training offers a variety of Professional Services. These courses reflect current networking and industry trends and are constantly evolving.

- **Generic and Bespoke Technology Training** - We offer full range of technology training courses from introductory to advanced level. A list of courses are identified overleaf, please check our website for the latest course offerings.
- **Virtual In-House Training Department** – Consider outsourcing all your training needs in one hit. We become your remote employees in which we carry your business cards, your brochures, your contact details, and your product expertise – representing your interests anywhere in the world. Ad-hoc and retainer based schemes available.
- **Technical Authoring** – User Guides, Quick Reference Material, Technical Presentations, Full Technical Documentation.
- **Courseware** - All courseware is developed in-house and copy written to MAX Training Limited unless the client funds development.
- **Seminar Hosting** – Max Training has undertaken a number of successful presentations as seminar hosts or guest speakers at events or road shows. Our deliveries at these events are informative, entertaining and engaging.
- **Apprentice Training** – Apprenticeship training schemes are thankfully returning to industry. We offer an apprentice training programme in which we work with you to deliver a syllabus which meets your business needs.
- **Technology Sales Courses** – This course takes features and benefits oriented sales people and introduces them to the consultancy sales approach necessary to compete and succeed in a converged marketplace. The course will cover the main applications and the business benefits associated with a converged infrastructure.

Course Portfolio

Sales Courses:

- Cerebral Selling – Influencing the sales process
- How to Sell Convergence

Principles Courses:

- Communications Principles - Radio, Mobile, Telecoms, Data & IP
- GSM, GPRS and 3G Primer
- ATM in 3G
- Transmission Technologies Overview
- Next Generation Networks – including an appreciation of 21CN

Technology Courses:

- xDSL Technologies
- TCP/IP – Various Levels
- VoIP
- SDH, CWDM & DWDM
- Ethernet and Metro Ethernet Technology
- Synchronisation Technology
- GSM/GPRS/Edge/3G Technology
- HSDPA/HUSPA/3G-LTE
- IMS Architecture
- WiMAX
- MPLS/VPLS
- IPTV – Multimedia over IP

Endorsements

I feel that the trainer is very articulate in his knowledge. The course was very comprehensive and provided interesting and useful content to the working environment. I strongly feel more courses should be delivered in this professional, entertaining and engaging manner.

Project Controller – Service Provider

I thought the course was excellent and definitely the best course I have been on with Ericsson. A great course with a very good trainer.

Global Technical Support – Vendor

I can honestly say in my 8 years at Orange that they were the best training courses I have ever attended.

National Tech Support – Service Provider



Training & Consultancy

Specialist Sales Courses



Cerebral Sales Training

Duration - 2 Days

The Problem

Success in business means successful communication, and a critical success factor in sales is the ability to influence the customer.

Most sales training focuses on the steps of the sale, meeting needs, handling objections and closing, and while these elements are crucial, the process that underpins them are more subtle but no less important.

We know that the emotional factors are equally, if not more important to success in sales and make the difference between mediocre and top performers. For example, a study by Martin Seligman, author of 'Learned Optimism' demonstrated that high optimism scores in sales people directly correlated to greater sales.

The good news is that optimism along with other emotional factors and can be learned by challenging the negative self talk that can hinder a salespersons performance.

Negative self talk can lead to self doubt, reduced confidence, unnecessary discounting, and a devalued product or service.

The Solution

At Max Training we have developed a course using techniques from Psychotherapy, Neuro Linguistic Programming and Psychology to help sales people recognise and eliminate negative self talk, self doubt and fear.

This improves;

- **Optimism**
- **Confidence**
- **Self Belief**
- **Motivation**

.....Which in turn leads to improved customer relationships and critically improved sales performance.

In fiercely competitive sales environments, companies are looking for more sophisticated high value sales training methods.

The Opportunity

MAX Training has partnered with leading clinical therapists to offer this ground breaking and unique course. Our training proposition combines top level insight and sophistication, partnered with years of experience in field based sales and clinical psychotherapy.

Take a leap forward with Cerebral Sales Training.

Call now to discuss your requirements - +44 (0)1903 520051

How To Sell Convergence

Duration - 2 Days

Aims – The communications industry is currently going through a technological revolution in which convergence and quad play are the by words. Not only is the technology and service set changing, but also the way in which these technologies should be sold is changing. One of the issues with this technology is that to the uninitiated, each vendor looks to have the same set of products and services on offer thus creating an intensely competitive environment. This two day sales course aims to take sales people who have been used to selling within an voice or data environment and seeks to foster sales skills which are appropriate and effective for a 21st Century networking environment.

Objectives – At the end of this course delegates will have a very good understanding of how best to approach as converged network sale, the questions they should be asking and the individuals within an organisation to whom they should be making their business case.

Topics Include:

Introduction - Convergence Vision

- This introductory session document the growth of Convergence, the transforming technologies and will seek to give delegates an understanding of the evolution of these technologies along with the products, content and opportunities they will create in the future.

State of the Market

- This section will give an appreciation of the main players active with the convergence market place. It will briefly consider their market share, product and look at the strengths and weaknesses.

Convergence Product Set

- This section gives a brief appreciation of the product set available to a converged services sales person and gives a very high level appreciation of how they work. This section will consider trigger events which create converged sales opportunities.

Tactical and Strategic Selling

- This section will introduce the consultative, strategic sales approach and align this against a traditional features and benefits approach of the technology sales person. It will detail why this approach is critical and how technology efficiencies and improvements must be transformed into board room survivable business and productivity benefits to stand any hope of success.

Qualification

- This section the standard questioning techniques which may be used in order to qualify a prospect and determine how much they understand about convergence and how serious they are about converged solutions.

Interactive Exercise – Creating a Winning Sales Proposal

- This interactive exercise will give delegates the opportunity to put what they have learned into practice. This on-going exercise will be interlaced by the course throughout the two days. In groups, delegates will be encouraged to think like a converged services sales person and construct a sales proposal from a scenario they will be given.

Sales Tools

- This section will give delegates access to common sales tools used by sales people in order to support their arguments, create compelling value propositions or handle objections.

Presentations

- We will illicit feedback from the groups and get a brief presentation on a proposed solution – justifying each decision made and aligning it with business best practice. This will be followed by a group discussion and collective feedback.



Training & Consultancy



Principles Courses



Principles Courses



Principles Courses

Principles Courses present a vendor independent technical appreciation for technical and non technical personnel alike.

We understand that the thought of attending a technical course may cause anxiety. We try to remove the fear, demystify the subject matter and make it easy to understand.

Typically principles courses assume no previous experience of the subject matter.

We focus on the "accessibility" of the technical information for the delegates. In short – we try to keep it simple – relying heavily on everyday analogies to present the course content. This way people learn almost unconsciously through osmosis!

Practical examples are given where possible and if we can simulate a particular technology across the classroom – we will.

Principles Courses:

- Telecommunications Principles
- Data, Internet & IP Principles
- Mobile Telephony Principles
- ATM within 3G Networks
- Fundamental Radio Principles
- Transmission Technology Overview
- GSM, GPRS & UMTS Overview
- Next Generation Networks

Portfolio Updates

New courses are coming on line all the time so if you don't see what you are looking for in the list above.

Please contact **MAX Training** on;

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Telecommunication Principles

Duration - 2 Days

Aims – The aim of this level entry course is to give technical and non-technical personnel a sound and thorough induction into to the world of telecommunications. This standards based, vendor-independent course will serve to inform delegates who have no industry knowledge which technologies dominate our industry and how they all fit together.

Objectives – At the end of the course delegates will be familiar with the fundamental principles and terminology underpinning telecommunications. Delegates will feel comfortable discussing analogue or digital issues surrounding telecommunications and have a good appreciation of telecommunications service offerings and the future direction of the industry.

Topics Include:

Characteristics of Human Speech and Hearing

- This section identifies the founding principles upon which telecommunications has been developed

Basic Telephony

- Outlines the history of the telephone and looks at the concepts governing a basic voice call across the PSTN.

Digital Transmission

- Defines the meaning of digital communications and describes how an analogue signal is converted to a digital through PCM techniques. This section also outlines the concepts behind G.703/G.704 framing and the basics of PDH/SDH transmission.

Networks

- Describes what a network is and identifies the main components. Breaks the network down into LAN, Access, Metro or Edge and Core and identifies the main technologies found at every level. We'll also consider some of the commercial issues regarding how different network providers work together.

Voice Communication Systems

- In this section we'll consider some of the equipment used to deliver a Unified Communications infrastructure. This will include traditional PABX, IP PABX, IP Centrex, Contact Centres, Presence Services, Unified Messaging, Fixed and Mobile Convergence and Collaboration.

Transmission Media

- Introduces the physical media which are used to transport telephony traffic around networks. Includes twisted pair, coax, fibre, microwave and satellite techniques.

Signalling and Switching

- Signalling provides the call control information that a network requires in order to set up and tear down calls correctly. This section looks at the various types of signalling found within a telecom network in public and private environments and seeks to give an understanding of how it works. This section will also touch on how this is done in a data environment.

Voice Over IP

- This section will give an appreciation of the principles of sending voice over a data network including compression, quality of service and the protocols governing this.

Next Generation Networks

- This section considers the architecture and main technologies underpinning the new all IP infrastructure that carriers are currently deploying. It will cover the applications, the equipment and give an appreciation of the main protocols and technologies which will dominate in these future networks.

Data, Internet & IP Principles

Duration – 3 Days

Aims – The aim of this level entry course is to give technical and non-technical personnel a sound and thorough induction into to the world of data communications. This standards based, vendor-independent course will address technical considerations and focus on the founding principles underpinning data communications. This course will be particularly useful to personnel cross training from a traditional voice to an IP voice or data environment.

Objectives - At the end of the course delegates will feel confident discussing technical issues surrounding data communications and have a sound grasp of the current techniques, protocols and standards employed within the communications industry today.

Topics Include:

Introduction

- This section aims to lay the foundation of the course by introducing the basic concepts behind data. This includes definitions of bit, baud, bandwidth, asynchronous and synchronous transmission, circuit and packet switching.

Interfaces and Physical Media

- Many physical interface standards are to be found within datacommunications equipment. This sections seeks to define and differentiate the more common ones and develop an understanding of the common media types found in networks today.

Communications Protocols

- Introduces you to the OSI 7 Layer model. Which is always referenced by data equipment manufacturers and service providers. This section will highlight why it is so important and define the building blocks of a communications protocol.

Digital Transmission

- The features of digital transmission will be identified here, including the concepts behind Time Division Multiplexing (TDM), PDH (Plesiochronous Digital Hierarchy) SDH (Synchronous Digital Hierarchy) technologies, Coarse Wavelength Division Multiplexing (CWDM), Dense Wavelength Division Multiplexing (DWDM), xDSL Technologies and Ethernet.

Optional Data Practical available for this course

Wireless Transmission

- Wireless Technology is becoming important. This section will give a general appreciation of wireless technologies including – WiFi, WiMAX, Microwave Technology and Satellite Technology.

LANs, WANs and MANs

- Networking plays a part in most peoples working lives today. This section will document the architecture of a service provider and an enterprise network.

Ethernet Technology

- This section will give an appreciation of Ethernet technology which is now used routinely by Service Providers. This section will conclude with an appreciation of VLANs and highlight their importance.

Data Networking Principles

- This section introduces you to IP technology and the main components responsible for IP connectivity. It will cover Switches and Routers, the principles underpinning IP and Routing Protocols.

The Internet

- The Internet is a infinite source of information, irrespective of how specialised the subject matter. In this final section we consider the architecture of the Internet and consider the role of an ISP, Back Bone ISPs and Peering Points.

Mobile Telephony Principles

Duration - 2 Days

Aims – This course is aimed at non-technical personnel. This standards based, vendor-independent course will consider historical, current and future direction of mobile networks. Our aim is to make delegates aware of the structure and function of a mobile network and use this as a foundation for identifying the technology development path beyond 3G.

Objectives – At the end of the course delegates will to give delegates a sound appreciation and insight into current mobile telephony techniques and future developments. Delegates will feel comfortable in discussing at length mobile voice and data issues. This course will act as a firm foundation for further study.

Topics Include:

Intro to Mobile Telephony

- The historical development from Analogue to Digital mobile standards are identified in this section. In addition the components of a GSM/GPRS and 3G network are defined and high level explanations given as to how they all fit together.

Radio Principles

- This section will give delegates an appreciation of the radio principles underpinning any radio based technology. This will include an appreciation of the Electro Magnetic Spectrum, basic line of sight propagation issues and modulation.

Radio Interfaces

- We will compare and contrast the TDMA and CDMA techniques used in 2G and 3G technology.

Mobility Functions

- Reviews some of the functions used within mobile telephony such as Registration and Databases, SIM Card Functions, Location Registers, Mobility Management, Roaming and Security.

Mobile Security

- This section considers mobile network security. The differences between GSM and 3G will be compared and contrasted.

Signalling

- This section outlines the importance of Signalling Systems used within a Mobile network, in particular Common Channel Signalling System No 7 (SS7).

Procedures

- The main operational procedures will be covered in this section including – Attach, Detach, Call Set Up, Call Tear Down, Handover, and Voice Mail.

Mobile Data

- Examines the concepts behind Mobile Data. This section will look a little more into the components responsible for carriage of data over the network including PDP Context Activation, Mobile Identities, Mobile Data Billing and Mobile Data Roaming and the higher broadband speeds offered by HSDPA/HSUPA.

Applications

- Applications will drive the capabilities of future networks. This section considers the main “sticky” applications which are attractive to service providers and will be great revenue generators.

IMS

- This final section documents the future of Mobile network architectures to show how they are changing and what an IP Multimedia Subsystem will deliver.

ATM within 3G Networks

Duration - 1 Day

Aims – This course is aimed at delegates who have an appreciation of datacomms or telecomms and want to know more about the technical principles of ATM and how the technology fits within a 3G environment.

Objectives – At the end of the course delegates will understand the characteristics of ATM and why it is the perfect protocol for 3G networks.

Topics Include:

Introduction

- This introductory section considers current voice and data technologies dominating our industry and aligns them against the characteristics of ATM. B-ISDN and its technical components are considered at this point.

ATM Principles

- The underlying technical principles of ATM are identified here including the service categories, switching, PVCs and SVCs, Virtual Paths and Channels, cell structure, and ATM Adaptation.

ATM Protocol

- Here we review the ATM Protocol stack so that you can see how ATM is structured. We also consider global standards bodies issues and show you how ATM is standardised.

Traffic Management

- Traffic management is crucial to ATM as it allows different traffic types to reside on the same network at no cost to performance. Issues covered here include, traffic descriptors, quality of service and traffic policing and shaping.

Signalling

- This section outlines the Signalling used within an SVC enabled ATM network. This is important as it is relevant to 3G ATM deployment.

Introduction to 3G

- This section briefly introduces 3G networks as a concept and defines the main architectural components. Included within this will be the UMTS wireless section, Node B, UTRAN, and the Circuit and Packet switched domains. An overview of the main interfaces will also be given here.

Positioning ATM within 3G

- In this section we consider where ATM as a technology is deployed within a 3G environment. We will include the various protocol stacks, Radio Network Layer including RANAP, Transport Network Layer including control and user planes and ALCAP.

Fundamental Radio Principles

Duration - 2 Days

Aims – The aims of this two day course is to teach the principles underpinning Radio Technology. The course is aimed at technical and apprentice personnel nearer the start of their careers in wireless communications who wish to start from a very solid foundation before entering typically a mobile vendor or service provider environment.

Objectives – At the end of this course delegates will understand the technology underpinning transmitters and receivers and understand the major propagation issues affecting a radio signal as it travels from the output stages of a transmitter to the input stages of a receiver.

Topics Include:

Introduction

- This introduces the notion of radio, identifying key milestones in radio development and finishes with an appreciation of the electromagnetic spectrum.

Electronic Principles

- An understanding of the electronic principles is key to really understanding radio technology. The principles of filters, tuners, amplifiers and decibels will be covered here.

Radio Propagation

- Electromagnetic waves have frequency dependent characteristics. This section focuses on line of sight and microwave frequencies and documents how the propagate through free space.

Modulation

- This section identifies analogue and digital modulation techniques as used in AM/FM broadcast and modern 2G/3G/WiFi/WiMAX environments.

Receivers

- A block diagram of the main stages of a receiver will be considered so delegates can really see the necessary steps involved with

Transmitters

- A block diagram of the main stages of a transmitter will be considered so delegates can really understand the necessary steps involved with transmission of audio or data.

Transmission Lines

- Here we look at the characteristics of transmission lines in order to carry EM waves efficiently. Twin feeders, coaxial cable and waveguides are considered.

Antennas

- We consider the final link in the transmission and reception of radio waves – the antenna. We consider omni directional antennas, directional antennas, antenna gain and intelligent beam forming antennas and MIMO.

Link Budgets

- This final section will consider the issue of calculating a link budget – a critical function in planning an wireless link. This tends to be done automatically today, however an understanding of the process and considerations is nonetheless an important core skill of any radio engineer.

Transmission Technology Overview



Duration - 1 Day

Aims – This one day course is aimed at technical and non technical personnel alike. It aims to give an appreciation of SDH technology so that delegates can understand the principles of operation and it's importance in the context of networking in general.

Objectives – At the end of this course, delegates will have sound appreciation of SDH, empowering them to take an active role in discussions involving SDH technology.

Topics Include:

Introduction

- This section introduces the principles of transmission technologies, identifying their position in the context of telecommunications and identifying the origin of SDH, including an appreciation of PDH and SONET. We also give an overview of the ITU G Series recommendations and ETSI specifications for SDH.

SDH Equipment

- We consider the main components of an SDH network, including Terminal Multiplexers, Add/Drop Multiplexers, Digital Cross Connects, Configuration and Management Terminals.

Containers, Units, Groups and Frames

- An appreciation of the components making up an SDH frame structure will help delegates see why SDH is so flexible and attractive to Service Providers. This section will look at the SDH multiplexer hierarchy and include an appreciation of Containers, Virtual Containers, Tributary Units, Tributary Unit Groups, Administrative Units, Administrative Unit Groups, STM-1 Frames.

Synchronisation and Pointers

- This section will show just how important Synchronisation is to high speed transmission networks. The mechanisms in place to address sync loss and sync variations are also addressed. Included within this section is mapping, aligning, pointer justification and an overview of the various qualities of SDH clock available.

SDH Management

- An appreciation of how SDH networks are controlled will give an insight into the importance of the manageability and controllability of an SDH network.

Physical Interfaces and Fault Tolerance

- This section considers the physical interfaces found on SDH equipment including G.703 Electrical, Multimode and Single Mode fibre. One of the attractions of SDH is it's ability to overcome physical failures and yet still remain in service. This section considers how this is achieved.

NGN - SDH

- This section looks at how Next Generation Networks SDH Technology works and discusses the flexibility it adds to a network service provider. LCAS, VCAT and GFP will be covered.

CWDM and DWDM

- Finally we will consider the nature of high speed optical networks, specifically Coarse and Dense Wavelength Division Multiplexing. We will consider the components, capacities and future of these incredible technologies.

GSM, GPRS and 3G Primer

Duration – 1Day

Aims – The aim of this one day course is to give a high level overview of the core mobile technologies which dominate now and what the future will hold. The course is aimed at technical or non-technical individuals, plus sales, marketing or project personnel who are moving into a mobile environment and want a good place to start before getting more involved with the various technologies dominating this area.

Objectives – At the end of this course delegates will have a very solid appreciation of the building blocks of a GSM network and understand the evolutionary path towards third generation systems.

Topics Include:

Introduction and Principles

- This opening section documents the path of mobile communications from analogue to digital systems. The section identifies all the pertinent steps from GSM, 2G, 2.5G through to the various releases of UMTS. The pertinent standards bodies will also be identified in this section.

GSM

- The principles, capacity issues, characteristics and building blocks of a GSM network will be defined and examples of what is involved in setting up and tearing down a call will be given. We will also cover the evolutionary steps towards GPRS.

GPRS

- GPRS introduces new data services over a GSM infrastructure. Here we identify the new components introduced for GPRS, document their function and discuss how data contexts are set up and torn down over a GPRS infrastructure.

GPRS Applications

- Once we have defined GPRS we look at some of the applications made available as result of having the service available.

3G Introduction

- In this section we consider the need, the applications and the competitive technologies in the field of third generation mobile systems. We compare and contrast the difference between a third generation and second generation network and discuss interworking between the two.

3G Products and Services

- Here we consider why 3G will be so desirable and document the services it will make available.

3G Architecture

- In this section we consider the architecture of a 3G network, it's components and how they interwork with each other.

High Speed Data

- This section considers the future evolution of high speed data over a 3G infrastructure and the main technologies which will make it happen including HSDPA/HSUPA.

3G, WiFi and WiMAX

- This final section looks at the threats to 3G and attempts to answer the question whether WiFi and WiMAX are competition or complementary technologies.

Next Generation Networks

Duration - 2 Days

Aims - The term Next Generation Networks is one the industry buzzwords which lacks clear definition. This one day overview course is for technical personnel who wish to be updated with the latest trends and evolving standards in converged access networks and Next Generation Soft Switch Technology.

Objectives – At the end of this course delegates will have a sound technical appreciation of the future architecture of Next Generation Networks and the technologies likely to dominate this area.

Topics Include:

Introduction and Principles

- This section introduces delegates to the principles underpinning a Next Generation Network in terms of what this means for the technologies and services on offer. This section will also introduce key technology found within an NGN including Triple/Quad Play, Fixed and Mobile Convergence, Soft Switching. A very high level appreciation of IP will also be given in this section.

NGN Architecture

- The Architecture of an NGN is positioned here so that delegates may see the key technologies and where they are found. The network will be broken down into Gateways to External Services, Core Networks, Metro Networks and Access Networks. This section will also include a consideration of the architecture of BTs 21CN Network architecture.

Core Network

- We will dig a little more into the core network in order to give an appreciation of the how the key core network technologies function. This section will include an appreciation of DWDM, MPLS, IMS and Soft Switching.

Metro Network

- This section considers the key aggregation technologies found within the Metropolitan Area Network including Ethernet. The course will look to the role of VLANs in the provision of NGN services and go on to consider CWDM and the newer type of Ethernet which Service Providers are currently considering deploying called PBT.

Access Network

- The key Access network technologies are considered within this section, including options for fibre – FTTH, FTTC and FTTN will be considered along with the role of the DSLAM and xDSL technologies and wireless technologies which have sufficient bandwidth.

Home Network

- This section considers important changes to the layout of the home network and the types of service which will be delivered by an NGN network to subscribers.

Enterprise Network

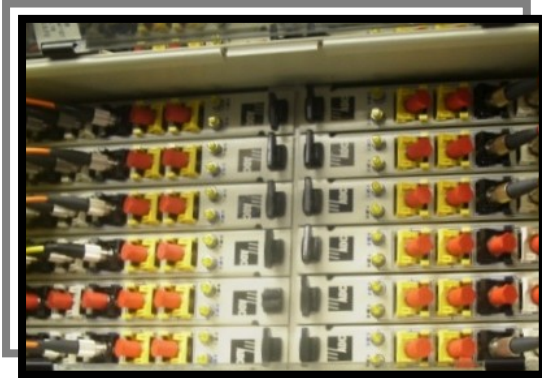
- The Enterprise network is becoming increasingly complex and is now handling a broad range of internal services. This section will look at the general architecture of a modern Enterprise network and consider the types of services that an Enterprise may well be interested in.

Content is King

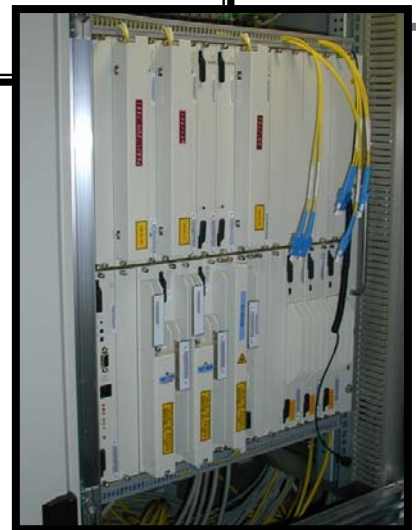
- This final section will consider the importance of content ownership and protection to a NGN service provider and considers what “sticky” services they may offer to keep their. This will also show how multimedia connections will be set up and torn down across an NGN with the help of SIP signalling.



Training & Consultancy



Technology Courses



Technology Courses



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Technology Courses

Technology Courses present a vendor independent technical training course, typically for technical personnel.

MAX Training have the engineering capability to deliver training courses down to the bit or protocol message level.

Typically principles courses assume exposure to our industry and a level of prior exposure to communications principles.

The content of in depth technical courses can be considered dry. We endeavour to maintain concentration though a lively presentation, plenty of question and answer sessions and the constant involvement and interaction of the group.

Practical examples are given where possible and if we can simulate a particular technology across the classroom – we will.

Technology Courses:

- ISDN
- Traditional TDM Signalling
- xDSL – Including ADS2+, VDSL, VDSL2
- Ethernet Technology
- SDH, CWDM & DWDM
- Synchronisation
- MPLS/VPLS
- Voice over IP (VoIP)
- Switching and Routing
- ATM
- SS7
- TCP/IP
- WiMAX
- GSM
- GPRS
- 3G Mobile
- HSPA
- Fibre Technology
- IMS
- IPTV

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ISDN Technology

Duration - 2 Days

Aims – This course is directed towards technical and non technical personnel alike who need to understand ISDN down to the signalling message level.

Objectives – At the end of the course delegates will have a full understanding of what ISDN is, how it works and the significance of the various components which constitute an ISDN interface.

Topics Include:

ISDN – Evolution and Need

- The introduction sets the scene for introducing ISDN as it describes the evolutionary path from an all analogue network to a fully digital core network.

Subscriber Access Methods

- This section introduces and describes the fundamental terminology surrounding ISDN such as Basic and Primary Rate, the “S” bus, “D” Channels, “B” Channels and “H” Channels.

Standardisation

- The main bodies involved with the Standardisation process of ISDN are considered here including; ITU, ISO, IEEE, ECMA, ANSI, CEPT, ETSI. An appreciation of the I, Q, X and V series of recommendations is also given. The section concludes with a comparison of ISDN and OSI 7 Layer Reference Model.

Services

- One of the attractions of ISDN to the user is its intelligence. This section considers that intelligence in terms of the services that ISDN is capable of delivering. This is broken down into three types of service, Bearer Service, Teleservice and Supplementary Service. The section concludes with an appreciation of the ISDN address scheme (telephone numbers) as defined in E.164.

Layer 1 protocol

- From this point the course adopts a logical layered approach to ISDN. This section considers the physical layer protocols for both Basic Rate and Primary Rate ISDN. Included within this is consideration of the “S” Bus, “U” Interface and the 2M G.703/G.704 Frame.

Layer 2 – LAPD

- An appreciation of the data link layer and show you how to tell if an ISDN link is up and in service and whether it is functioning properly. Included within this section is LAPD Messages, including SABME, RR, RNR and the link set up and tear down protocol sequence.

Layer 3 – Q.931

- This is where the intelligence of ISDN is to be found. Here we give an exhaustive appreciation of the layer 3 Q.931 protocol. This will include an analysis of the Frame Structure, Single Octet and Variable Length Messages, Supplementary Services and Trouble Shooting advice. Additionally we will work through a call from set-up to teardown looking at all the layer 3 messages involved.

ISDN in a VoIP Environment

- This final section considers the future of ISDN in the light of IP based networks. We will consider IP PBXs, Gateways and backup.

TDM Voice Signalling

Duration - 2 Days

Aims –This course is directed towards technical personnel who need an in-depth technical understanding of these traditional signalling protocols. This course is targeted at those engineers who require an understanding of these protocols which could be engineers within a traditional Telco or engineers in the Gateway marketplace. A firm understanding of telecommunications would be a pre-requisite for this course.

Objectives – At the end of the course delegates will have a firm grounding in the protocol, format and layered protocol architecture of all four signalling protocols. The delegates will be very well versed in the structure and contents of signalling messages and also how to interpret them.

Topics Include:

Introduction to Signalling

- This section will give you comprehensive technical appreciation of what signalling is, where it is found and it seeks to define and differentiate a variety of types. Included within this section is 2-Wire, V5, Common Channel, Channel Associated, Public and Private Signalling Systems.

DPNSS Overview

- The DPNSS signalling protocol is given a thorough examination in detail. History is considered Levels 1,2 & 3 are rigorously broken down and DPNSS applications are considered. Supplementary service groups are defined and analysed.

DASS2 Overview

- The DASS2 signalling protocol is given a thorough examination in detail. History is considered, and Levels 1,2 & 3 are rigorously broken down and DASS2 deployment is considered.

Q.931 Overview

- The Q.931 signalling protocol is given a thorough examination in detail. History is considered, and Layers 1,2 & 3 are rigorously broken down and Q.931 deployment is considered. Supplementary services are defined and analysed.

Q.Sig Overview

- The DASS2 signalling protocol is given a thorough examination in detail. History is considered, and Levels 1,2 & 3 are rigorously broken down and DASS2 deployment is considered. Supplementary services are defined and analysed.

Signalling Message Examples

- Some examples of signalling message strings from the different signalling protocols are considered and interpreted.

Duration - 1 Day

Aims – The aim of this course is to give technical personnel an insight into the high bandwidth local loop copper based solution, which is a critical component of BT's 21CN. The course focuses on the main "Digital Subscriber Line" technologies (ADSL, ADSL2+, VDSL, VDSL2) and discusses implementation issues, capacities and impediments.

Objectives – At the end of this course delegates will understand and be able to differentiate between the various digital subscriber line solutions and state their characteristics and limitations. Delegates will have a thorough grounding in the components of a DSL interface and understand the benefits and services that the technology delivers.

Topics Include:

Introduction

- Introduces the subject of xDSL and looks at the process of Copper Access technologies and the need for DSL. Local loop unbundling (LLU) is also considered here. Some of the problems associated with DSL deployment will be considered here.

Digital Subscriber Loop Technologies

- The family of DSL technologies are considered and defined to give you a clear understanding of the technology capabilities, performance and functions. The technologies within the family includes ADSL, ADSL2, ADSL2+, READSL, VDSL and VDSL2.

ADSL

- An in depth look at ADSL2/ADSL2+ technology including the Available Frequency Bandwidth, Modulation Techniques, Vendors, Implementation, Service Offerings and Standardisation.

VDSL/VDSL2

- An in-depth look at VDSL technology including Modulation schemes, likely deployment strategies, Offerings and Implementation.

Voice, Internet and Multi-protocol Support

- This section looks in more detail at the how different protocols are carried by the various DSL technologies and the role of copper in the 21CN or NGN Access network. Specifically an appreciation of how voice can be carried over DSL technologies will be considered.

Standardisation and Subscriber Access

- This section looks in depth at the protocols and concepts behind ADSL, including Security, Multicasting, Unicast and Broadcast support. It also examines the infrastructure outlining the role of the DSLAM (Digital Subscriber Line Access Multiplexer), and the move away from ATM to IP.

Duration - 2 Days

Aims – This course is aimed at technical personnel who have a good appreciation and working knowledge of communications technology and builds upon that knowledge to give an understanding of Ethernet Technology and how this has reached out across the Metropolitan Area Network to become an important transport mechanism for converged services.

Objectives – At the end of this course delegates will have a firm understanding of the technical principles underpinning Ethernet Technology as found today in both service provider and enterprise network environments and will feel very comfortable in discussing these issues with colleagues and clients alike.

Topics Include:

Introduction

- Historical appreciation of the origin of Ethernet and the evolution of it as new transport mechanism for NGN IP based networks.

Frame Structure

- This section will look at the principles underpinning any data link technology standard 802.3 Frame Structure and consider differences in framing, media and encoding across 10M, Fast, Giga and 10G Ethernet.

Ethernet Switching Technology

- The various types of switch will be considered here including store and forward and cut through - along with some of the additional IEEE 802 specifications that they support such as 802.1Q/p, 802.1x, GARP. Spanning tree and improvements such as Fast Spanning tree will also be covered. We will also give a consideration in this section to Nortel's PBT technology for service provider environments.

Optional Ethernet Practical available for this course

Ethernet VLANs

- This section will give a technical overview of the various mechanisms associated with VLANs including VLAN Registration and Tagging and QoS.

Service Provider Approaches to VLANs

- Here we look at the work of the Metro Ethernet Forum (amongst others) and determine how a scalable SLA/QoS enabled VLAN service can be offered to multiple users. This will include QinQ stacking and Mac Header Stacking.

Wireless Ethernet

- Wireless networks are ever more prevalent and here we consider the provision of Ethernet over WiFi. Included within this section will be VoWLAN, Frequency of Operation, Security, Capacity and Functionality.

Testing Ethernet

- This concluding section will cover all the main techniques employed when trying to troubleshoot and Ethernet environment and will focus on the main tools which may be enabled to do so – included within this will be an appreciation of Ethereal.

Duration - 3 Days

Aims – This course aims to educate technical personnel in the structure and multiplexer hierarchy that is Synchronous Digital Hierarchy. This course compares and contrasts PDH, SDH and SONET technologies and plots the development and future direction of SDH towards NGN-SDH and into the CWDM and DWDM Technologies.

Objectives – At the end of this course, delegates will have a thorough understanding of SDH multiplexing technology, terminology, equipment and applications and the evolution to the higher speed transmission technologies.

Topics Include:

Introduction to SDH and Transmission Technologies

- This section frames SDH as a technology. It defines why it was developed in the first place, considers what it was designed to replace and presents the advantages that SDH gives to a service provider. Included within this section is an appreciation of analogue voice to digital PDH. Some of the key characteristics of SDH are identified here.

Network Architecture

- This section considers the topology of an SDH network in a typical service provider environment. Included within this section will be an overview of the ring protection mechanisms within SDH, Alarm Structure, Performance Monitoring and Synchronisation of SDH networks.

SDH Lower Level

- This section concentrates on the lower level of the SDH multiplexing hierarchy. The multiplexing structure and the overhead for each stage is covered in detail.

SDH Higher Level

- Here the multiplexing and mapping of signals into the higher level of the SDH payload. The path overhead associated with this higher level payload is studied in detail.

Section Overheads

- The addition of Regenerator Section Overhead (RSOH) and Multiplexer Section Overhead (MSOH) is addressed within this section. The practical implementation and use of the overhead sections are considered.

Network Management

- This network management overview will consider SDH element management, concentrating of alarm generation and processing within an SDH environment. In addition the transport of management traffic will be considered.

High Speed Optical Transmission

- This introductory section will consider the nature of optical communication, the optical windows, fibre limitations and consider Multi and Single mode, dispersion impediments and types of Single Mode fibre.

Dense Wavelength Division Multiplexing

- The course concludes with an appreciation of CWDM and DWDM Optical switching technologies. the increased bandwidth need, the principles, including the ITU Grid. We will then consider DWDM Components and the architecture of a typical carrier network and considers where SDH, CWDM and DWDM fit and how they are utilised.

Synchronisation Technology

Duration - 3 Days

Aims – Synchronisation is essential to any network. Loose Synchronisation and you are likely to have a poor quality network at best. This course is designed to give an in depth analysis to the issues surrounding synchronisation and present several best practice solutions for different types of networks, be they wireline or wireless. This course is ideally suited for engineering staff from Carriers, Vendors and Corporates with large enterprise networks to manage. Prerequisite for this course is a solid background in telecommunications

Objectives – At the end of this course delegates will have a clear understanding of what synchronisation is and how it impacts networks. Delegates will also be able to apply the Sync design principles learned on the course to their own networks ensuring optimum performance and network stability.

Topics Include:

Introduction to Network Sync

- This introductory session is designed to give you an understanding of exactly what network synchronisation why it is necessary. We also document the origin of sync through traditional networks to the challenges of contemporary networks and present typical examples of sync plans.

Principles of Synchronisation

- Here you will learn the main terminology and acronyms associated with Sync and get a clear understanding of what they mean. Terms such as Phase, Frequency, Jitter, Wander, Locked, Holdover, Free Run, Slips and Pointer Adjustment will be covered.

Standards and Sync Elements

- There are many standards bodies producing sync recommendations, we cover the main recommendations from the ITU, ETSI, ANSI and Telecordia. PRC/PRS, GPS, Slave Clocks including SSU, SEC, VCO and PLL principles, Electrical I/F, Jitter and Wander.

SDH Measurement, Quality & Alarms

- Measuring whether a clock signal is good quality or not is critical. This section considers the mechanisms in place to define clock quality and shows you how to measure them, TIE, MTIE, TDEV derivations are considered, as is calculation of slip events. Alarm conditions are also considered here.

Sync and Technologies - PDH, SDH & SONET and ATM Technology

- This brief overview is to refresh delegates on the concepts of these technologies focussing on the areas relevant to Synchronisation.

Mobile Networks

- This section focuses on mobile networks, defining standards for GSM and 3G. UTRAN sync architecture, Node B sync and FDD/TDD modes of operation are covered. Iub interface wander will also be covered.

Optical Transport Networks

- Different choices are available for sync architecture. Here we identify and define the options including Inter and Intra Networks Architecture, Master Slave PRC, Flat PRC, Hybrid PRC, Intra Node Architecture and Sync Interworking.

Sync over IP Technology

- In this section all the issues regarding sync over packetised networks are considered. IP packets do not themselves have a consistent predictable arrival rate necessary for synchronisation. This section considers the solutions for this environment.

Sync Design Examples

- Gateway Sync Quality, Client Requirements, Chain Sync, SDH Mux Rings, Transit and Access Architecture, E1 for sync transport, Multiple inputs for each SSU, Nominate PRC sites, Testing Non Sync Equipment, Practical Prioritisation, Management and Proof of Sync Configuration

MPLS/VPLS

Duration – 1 or 2 Day

1 or 2 day depending upon IP experience

Aims – One of the key issues of converged IP networks is how to ensure that different services receive an appropriate Quality of Service (QoS). This cannot be achieved without the ability to differentiate between various traffic types. The aim of this course is to give delegates an appreciation of one such mechanisms of achieving differentiated traffic flows around an IP network – Multi Protocol Label Switching (MPLS). This course assumes that delegates have a firm grasp of data and IP principles for the one day course.

Objectives – At the end of this course delegates will have a firm grasp of the principles of MPLS, and it's importance as a Core and Metro based networking solution.

Topics Include:

MPLS Introduction

- This introductory section outlines the MPLS protocol family and positions them in the context of networking within today's high speed data network architectures. We will also introduce MPLS terminology such as Forward Equivalence Class, Label encoding, distribution and binding etc.

Switching and Routing

- This section recaps on the concepts surrounding switching and routing, and the part they play in Label Switched networks.

The OSI Model

- An essential brief overview of this OSI 7 Layer protocol stack in order to position MPLS, and how it relates to the other layer 2 and 3 protocols in use within a typical network.

MPLS Concepts

- Here we describe the concepts of MPLS in more detail. You will learn about the main components,, what MPLS does, how it works and more about CE Routers, PE Routers. We will consider the MPLS protocol stack in detail.

Traffic Engineering

- This section describes how label paths are determined through constrained and explicit based routing and how fast re-routing can accommodate network failures. It will then go on to consider Path Signalling, Data Forwarding, Forwarding Tables, RSVP-TE, and CR-LDP

MPLS and Diff-Serv

- We describe Diff-Serv and how the diff-serv classified traffic is mapped to the correct code point and hence into MPLS using the Shim Header.

MPLS VPNS

- This section considers MPLS and Virtual Private Networks. Both L2VPNS and L3VPNS can be easily created within MPLS. These are not the only mechanisms and this section will consider the options which exist today and their functionality.

MPLS and Wide/Metro Area Networks

- You will hear about how routing protocols interact with MPLS including OSPF/ISIS and BGP. We will also consider MPLS interaction with customer routing protocols and, backbone and VPN addressing and extended communities.

Using MPLS

- MPLS has a large number of applications associated with contemporary demands for high speed networking. This section examines traffic engineering methods and outlines some of the applications for MPLS, in particular Voice over IP, Video on Demand (VoD) and IPTV.

Voice over IP (VoIP)

Duration - 2 Days

Aims – This course assumes that delegates have a general understanding of data and IP principles. This standards based, vendor independent course will outline the technical components, protocols and functionality of VoIP and how it converges into an IP network. This course is ideal for delegates wanting an independent unbiased presentation of the technical issues surrounding the deployment of such a solution. The course will identify best practice VoIP deployment and utilisation.

Objectives – At the end of this course delegates should feel confident to talk with authority about VoIP and be able to follow technical discussions on the subject with ease. Delegates will therefore be empowered to make informed decisions regarding any potential VoIP deployment with their own networks.

Topics Include:

Introduction

- This introductory section will make you aware of the requirements and characteristics of real time voice traffic as found with the Public Switched Telephone Network (PSTN). The course will cover the importance of signalling in this context.

Why use Voice over IP?

- We outline the challenges that face users and integrators of Voice over IP solutions and the benefits of migrating to Voice over IP.

IP Protocol Suite

- A good grounding in IP Technology is necessary to understand the environment in which VoIP will exist. This section will consider the IP protocol suite as a refresher and position the key VoIP protocols within it.

Voice over IP Introduction

- In this section we will present a summary of Voice over IP and the components used to build a complete Voice over IP solution. In addition we look at the common protocols used for Voice over IP including SIP, SDP and MGCP & MEGACO.

H.323 Protocol

- You will be presented with appreciation of this core protocol for completeness as SIP has become the protocol of choice.

Emerging Voice over IP Protocols

- The standards issue regarding VoIP is far from settled. In this section we look at the Voice over IP protocols that are fast finding favour with various vendors and providers. We consider Session Initiation Protocol (SIP), Media Gateway Control Protocol (MGCP) and MEGACO. We will also consider how Resource Reservation Protocol can be used to assist with the control of Voice over IP calls.

Quality of Service

- In typical deployments, Voice over IP traffic will be co-resident with traditional data services on the same network. The lack of built in quality of service protocols into TCP/IP means that methods need to be implemented to ensure secure and logical transfer of voice over IP networks. This section looks at the issues concerning Quality of Service and some of the methods employed to ensure voice quality.

Implementing Voice over IP

- Here we review some of the products, services and applications available for the installation and operation of Voice over IP service and networks. In addition we consider the network pre-requisites which must be in place for VoIP to function successfully.

Convergence and Quad Play

- This final section looks at VoIP in the context of an enterprise Unified Communications environment and considers where and how voice fits into it.

Switching and Routing

Duration - 2 Days

Aims – This two day course assumes that delegates have a general understanding of data and IP principles. This standards based, vendor independent course will focus exclusively on the technical principles underpinning any switched or routed networking environment. At the end of the course delegates will have a very good and comprehensive understanding of the current switching techniques and routing algorithms used on networks today.

Objectives – At the end of this course delegates should feel confident to talk with authority about various switching and routing techniques discussed within the course and also have a good understanding of how to go about trouble shooting these routed or switched environments.

Topics Include:

Introduction

- This introductory will ensure that all the principles of data communications are very well understood including the OSI 7 Layer model, an understanding of which is critical to adopt a logical fault finding approach to IP networks.

Intro to Switching and Routing

- Here we give a brief appreciation of the background to switching and routing. We discuss the main standards bodies, main standards and discuss how these technologies have evolved over the years.

Switching

- The various types of switch will be considered here including store and forward and cut through - along with some of the additional IEEE 802 specifications that they support such as 802.1Q/p, 802.1x, GARP. Spanning tree and improvements such as Fast Spanning tree will also be covered.

Routing

- In this section we will present an overview of routing and routable protocols. We will discuss the nature of Distance Vector and Link State routing protocols and consider the pros and cons of each one. The protocols introduced here will include RIPv2, EIGRP, OSPF, ISIS and BGP-4.

Practical can be included on this course

Interior Gateway Routing Protocols

- Enterprise routing protocols tend to be Interior Gateway Routing Protocols. This section looks at the notion of OSPF in some detail so a complete and comprehensive understanding can be gained.

Exterior Gateway Routing Protocols

- ISPs and large enterprise embrace Border Gateway protocols today and this section seeks to thoroughly cover BGP-4. This will include a consideration of autonomous systems, summarisation, confederations, i-BGP and e-BGP.

MPLS and QoS

- This section will consider where routing and switching fit within a modern converged service provider environment and consider the routing function of MPLS/VPLS and how that ensures optimal label switched path selection.

Trouble Shooting

- This section considers some of the many and varied mechanisms in place to undertake a very logical layered approach to fault finding within a switched or routed environment. A variety of tools will be demonstrated including Ethereal and a number tools from the IP test suites, plus specialist test equipment where appropriate.

ATM Technology

Duration - 2 Days

Aims - This course is aimed at technical personnel who have a good general understanding of communications technology. The course will give delegates a very firm grounding in the terminology, function and positioning of all the elements of an ATM network.

Objectives - At the end of the course delegates will be able to discuss the technical issues associated with ATM with authority. The knowledge gained from this course will prove to be extremely valuable in future technical/sales environments.

Topics Include:

Introduction

- An introduction to the Communications Industry today, highlighting the push towards multimedia networks such as Broadband ISDN.

ATM Overview

- This section introduces the basic concepts behind ATM and their historical development.

Standardisation

- An overview of the seven layer OSI model and how ATM can be defined as an OSI Layer 2 protocol. This section includes the structure of the ATM forum and the ITU Standards bodies who are largely responsible for the development of the technology, the key specifications and recommendations are identified.

ATM Physical Layer

- This section focuses on the Transmission Convergence (TC) Sub-Layer and the Physical Media Dependant (PMD) Sub-Layer. These two sub-protocols define the physical layer for ATM. This section finishes with an appreciation of how TC and PMD practically manifest themselves within SDH technology.

ATM Layer

- Here we identify the functions at OSI Layer 2, this includes defining different cell types, examining the cell structure itself and considering the five byte header in bit level detail

ATM Adaptation

- ATM can handle any type of traffic in whichever format it arrives at an ATM Node. Ultimately all traffic across an ATM network travels as cells. Adaptation is how ATM converts traffic as it arrives into fixed data blocks for transmission as cells. AAL1, 2, and 5 will be considered.

Traffic Management

- A crucial issue for ATM is how traffic across it may be managed. This is very important as ATM makes certain contractual guarantees for certain traffic types. Traffic management is the term used to describe the mechanisms ATM uses to ensure contractual compliance. Included here is traffic shaping, policing and QoS issues.

Signalling – Q.2931

- Connections across ATM networks may be dynamic. This signalling protocol is responsible for call control, and thereby allowing dynamic connections to take place. Here we break down and analyse the protocol message structure.

ATM in 3G Networks

- ATM is a key component of 3G networks today. This section considers where and how it is used and will consider the protocols found on the IuB, IuR, IuCS and IuPS including RANAP, RNSAP etc

PNNI

- This section deals with the issue of scalability and seeks to prove that using the Private Network to Node Interface (PNNI) in order to evolve a network which retains the management features irrespective of its size.

Duration - 2 Days

Aims – The course aims to educate technical personnel in the principles and foundations underpinning SS7. It is based on the International Standards and will address the technical considerations to give delegates a thorough understanding of the structure and operation of SS7 switching networks.

Objectives – At the end of this course delegates will have a sound and thorough grasp of the rudiments of a layered common channel signalling system, the elements of SS7, IN and how new developments for fast and flexible IP based communications services will be delivered.

Topics Include:

Common Channel Signalling Introduction

- This first section outlines the basic signalling functions and documents the origins of SS7, including a review of SS6. It focuses specifically on in band and out band signalling and common channel signalling (CCS).

Signalling Points

- Here we review all the elements involved with SS7 including the Service Switching Point (SSP), the Signal Transfer Point (STP), the Service Control Point (SCP) and Intelligent Peripherals (IP).

The signalling link

- SS7 has a number of signalling link definitions. In this section we give a clear definition of the various links and a description of where they fit within an SS7 network infrastructure. Signalling links A-F are covered.

SS7 Protocol Stack

- SS7 is a layered protocol, for full understanding of SS7 you have to have a clear appreciation of the Protocol Stack and how it functions. This section focuses on the bottom two layers of the SS7 protocol stack Message Transfer Part 1 & 2. MTP2 is compared to HDLC and signalling link error monitoring, detection and recovery are considered.

Network Layer

- This section covers the network layer functions of SS7. The main topics for consideration include Signalling Network Functions, MTP 3, Signalling Message Handling and Routing labels.

Higher Layers

- The higher layers in SS7 can be considered as the applications of SS7. This section considers those applications, defines their function, message structure and meaning. Included here is the Signalling Control Connection Part (SCCP), Telephony User Part (TUP), Data User Part (DUP), Transaction Capabilities User Part (TCAP), ISDN User Part (ISUP) and CAMEL Application Part (CAP)

Intelligent Networks (AIN)

- This section seeks to address the subject of Intelligent Networks. The intelligent network services include Trunk Signalling, 800 Database, Alternate Billing Services (ABS), Mobile Applications Part (MAP) and Local Number Portability (LNP) Personal Numbering.

SS7 Within IP Networks

- This final section will consider future VoIP environments and considers how SS7 will function in an all IP world and discuss the function of such devices as signalling gateways.

Duration - 2 Days

Various levels of this course offered to suit the audience profile

Aims – This course is aimed at technical or non technical personnel who have not yet been exposed to an IP environment. It therefore assumes no prior knowledge of IP protocols or standards. The course starts at ground level and gives delegates an insight into the TCP/IP family of protocols defining their function and their limitations. Beyond this, the course considers internetworking devices at both layer 2 and layer 3. It then focuses on the TCP/IP protocol stack and finishes with an overview of the structure and operation of the Internet.

Objectives – At the end of this course delegates will be confident in their understanding of LAN protocols and internetworking devices. The delegates will also have a clear understanding of the TCP/IP protocol suite to a level whereby they can converse authoritatively at a technical level with clients or colleagues.

Topics Include:

TCP/IP Introduction

- This introductory section outlines the origin of TCP and IP as protocols and shows how they were combined into a suite of protocols known as TCP/IP. This section then compares TCP/IP to the OSI 7 layer model for comparison.

The Importance of IP

- This section documents the importance and dominance of IP in networks today. It identifies the function of the protocol in LANs, WANs, Public and Private Networks, and also positions it within the newer mobile networks of tomorrow, UMTS and GPRS.

The Physical Layer

- Here we look at more technically at exactly how the TCP/IP protocol is carried over LANs and WANs. Here we focus on Ethernet & Token Ring LANs, X.25, Frame Relay, ATM, ISDN, and ADSL.

The Internet Layer

- In this section we outline the IP protocol including structure, content and fragmentation, and IPv4 address structure. IP address allocation within an internetwork and sub net masking and intranet addressing schemes. Additionally we look at attempts to conserve the heavily subscribed IP address pool, including port and network address translation.

The Host-to-Host Layer

- In this section we introduce a number of protocols used for reliable and unreliable transport of traffic, TCP, UDP and ICMP. This section discusses the meaning of ports and sockets and TCP connectivity.

Application Layer

- TCP/IP is designed to carry applications around data networks. Here we look at the more common, including SNMP, FTP, TELNET, SMTP, POP, DHCP and DNS.

Routing Overview

- Introduces routing and addressing schemes and reviews some of common routing protocols, Static, RIP, OSPF, BGP(Including CIDR), IS-IS.

IPv6

- In this section we outline the need for this new technology and addressing scheme, and review the differences between IPV6 and IPV4.

Voice over IP

- A brief introduction to the technology, components and main protocols responsible for allowing voice over the data network.

Internet Security and VPNs

- There is a great deal of paranoia surrounding private data over public network. This section will discuss standard network security, VPNs and issues related directly to IP in this regard.

Duration - 2 Days

Aims – The promise of WiMAX is that broadband mobile access will become a reality quicker, cheaper and with plenty of capacity over the next few years. The aim of this two day introductory course for technical and non-technical personnel alike, is to introduce delegates to the 802.16 family of WiMAX specifications and break down the technology so that a comprehensive appreciation of the market and technology today, plus the evolution of this technology can be documented.

Objectives - By the end of the course delegates will have a very clear understanding of this exciting disruptive technology and will be able to converse with confidence about WiMAX in a technical or commercial environment.

Topics Include:

Introduction

- This introductory session will cover the concepts of WiMAX technology and seeks to define the key market areas which WiMAX will address. This will include an appreciation of Last Mile Connectivity, Hot Spot Working, Cellular Backhaul, High Speed Enterprise connectivity and Mesh Networks.

WiMAX Family of Specifications

- There are many different IEEE Specifications and this section picks out the relevant ones to WiMAX and seeks to define their meaning including 802.16e and 802.20 and WiBro. They will then be aligned against the work of the WiMAX Forum where their “operator profiles” will be presented.

Hardware Appreciation

- We introduce some of the main components found within a WiMAX environment including Base Stations, Antennas, CPE, Access Points and mobility devices.

WiMAX RF Issues

- This section will cover some of the Line of Sight (LOS) and Non Line of Sight (NLOS) issues associated with WiMAX, including path loss, multipath and fading. In addition modulation will be considered including BPSK, QPSK, 16QAM and 64QAM. Finally the issue of TDD and FDD will be discussed including the benefits of each approach.

WiMAX Physical Layer

- There are several physical layers defined for WiMAX which will all be covered on the course. They will all be included – SC PHY Layer, OFDM PHY Layer, OFDMA PHY Layer. In addition advanced antenna techniques will be discussed such as Adaptive Antenna Techniques, MIMO and Spatial Division Multiple Access.

WiMAX MAC Layer

- Media Access Control is a critical function in any wireless environment. This section analyses the WiMAX MAC layer and will consider the Frame Types and Classes, Access Methods, Sync and Power Management, Bandwidth Request/Grant Scheme, Link Adaptation and Automatic Repeat Request (ARQ).

General Operation

- This section considers the principles of operation of a WiMAX network including access, bandwidth allocation, congestion, flow control, scheduling, retransmission, handover, and security.

The Future of WiMAX

- In this final part we consider the future for WiMAX and consider the evolution of the 802.16 specification and look at some of the things which can be done to the wireless interface to significantly increase throughput.

GSM Technology

Duration - 2 Days

Aims – This course aims to educate technical and non technical personnel in the hierarchy and function of GSM mobile networks. This course acts as a great springboard for engineers who are likely to be involved with mobile technologies, either current GSM networks or future TDM or UMTS networks.

Objectives – At the end of this course delegates will have a clear understanding of the origin of GSM mobile networks, the components and functions of a GSM network and the future technologies likely to dominate this marketplace..

Topics Include:

Intro to GSM Mobile Networks

- An overview of the history, network architecture, and frequency allocations of the GSM networks. This section also describes the difference between bearer and tele services, and continues to describe speech calls, circuit switched data services, Short Message Services (SMS), Wireless Applications Protocol (WAP) and Unstructured Supplementary Data Services (USSD).

Mobility Functions

- Discussed in this section are registration and related location registers (databases), SIM card functionality, location updates and roaming, location of subscribers, and charging issues associated with mobility.

The Mobile Station

- This section concentrates on the operational modes and power classes of the mobile station (MS).

The Network Sub System

- Here we describe the functions of the Mobile Switching Centre (MSC), the Visitor Location Register (VLR), the Home Location Register (HLR) and the Network Management Centre.

The Base Station Sub System

- An examination of the components of the Base Station Sub System (BSS), the Base Station Controller (BSC), the Transcoder and Rate Adaptation Unit (TRAU) and the Base Transceiver Station (BTS) including sectorised and omni configurations.

Signalling

- In this section we describe the various signalling protocols employed within the GSM network which includes Common Channel Signalling Number 7 (SS7) in the Network Sub System as well as LAP-D and LAP-Dm in the BSS.

Radio and Terrestrial Transmission

- An overview of the transmission techniques used between the various network elements. Topics include the Air Interface, FDMA and TDMA techniques as well as physical and logical channels, problems associated with the air interface and solutions such as frequency hopping, diversity etc. Terrestrial transmission based on G.703/G.704 PDH are also addressed.

Network Planning

- A brief outline of some of the considerations to be taken into account when planning a network and increasing cell capacity.

The Future of Mobile Networks

- This section deals with the new developments in mobile networks including General Packet Radio Services (GPRS), Enhanced Data Rates for GSM Evolution (EDGE) and 3G Systems.

GPRS Technology

Duration - 2 Days

Aims – General Packet Radio Services allows fast data transfer speeds combined with voice mobile telephony over a common Air Interface. GPRS signals a voice and data mobile network which has truly come of age. GPRS is an evolutionary step towards UMTS and allows GSM networks operators to offer a greater array of services and thus get more mileage out of their current infrastructures. The aim of this course is to give a technical appreciation of the mobile elements peculiar to GPRS.

Objectives – At the end of this course, delegates will have a thorough understanding of what GPRS can offer the network hierarchy and how it works technically.

Topics Include:

Introduction

- This section explains the evolution from GSM to GPRS, stressing the differences between packet switched and circuit switched data modes. An overview of the network architecture is included with its connections to GSM and other data networks.

GPRS Services

- Here we cover the various services available as result of the introduction of GPRS services. These include Point to Point Services, Multipoint Services, GPRS supplementary services, GSM short message services (SMS) together with a description of anonymous access.

Short Message Services

- An overview of the SMS architecture and functionality together with the features of SMS, addressing of messages, Mobile Originated (MO), Mobile Terminated (MT) short messages, delivery confirmation and internetworking.

GPRS Network Architecture

- In this section you will learn the functions of the GPRS network elements including the Gateway GPRS Support Node, Serving GPRS Support Node (SGSN) and the Base Station Sub-System (BSS). Additionally the GPRS backbones and the functionality of the Home Location Register (HLR) and the Point to Multipoint Service Centre (PTM-SC) in GPRS.

Mobility Management (MM)

- This section describes the GPRS MM states, routing areas, the interaction between SGSN and MSCs, GPRS attach, Paging and Routing Area and Cell Updates.

GPRS Security

- Following this section you will understand the GPRS over the air security aspects, screening of data, point to multipoint security and GPRS backbone security.

The Air Interface

- A brief outline of the UMTS network architecture covering the network elements, traffic and signalling interfaces, followed by the services offered by UMTS together with charging, security and handovers (hard, soft and softer).

Packet Data Transfer

- This final section covers the transmission plane protocols, including TCP/IP, Frame Relay, and less generic GPRS protocols including the GPRS Tunnelling Protocol, Sub-network Dependant Convergence Protocol, Logical Link Control, Radio Link Control and Medium Access Control.

3G Mobile Telephony

Duration - 2 Days

Aims – This course aims to educate delegates in the essential protocols that dominate a UMTS environment. The course focuses on the wireless sections of a UMTS network, the 3G network architecture and the services delivered from the core. This course should serve as a very useful engineering foundation course for personnel likely to be involved in any way with 3G networks.

Objectives – At the end of this course, delegates will have a thorough understanding of the technical capabilities of a UMTS network, the services likely to be offered and the network architecture including how the various elements interwork.

Topics Include: Please note a 1 day 3G overview is available on request

Introduction to UMTS

- In this introductory section you will learn about the evolutionary path from GSM to UMTS, in which the history and various global standards organisations will be documented. You will also understand the global frequency allocations.

UMTS Services

- Here you'll hear about the Bearer Services, Tele Services and Quality of Service (QoS) and the four classes of service, including conversational, Interactive, Streaming, and Background. Additionally circuit and packet switched services are listed. The handover of different service types to and from GSM are described as user, network, data and application security together with user and network authentication. The Virtual Home Environment (VHE) and wireless protocols are also covered.

Spread Spectrum (SS) Techniques

- In this section we describe the different spread spectrum techniques available, but concentrate on the Direct Sequence (DS) option. We'll explain the basic DS element, the RAKE receiver, Power Control, Soft Handover, Inter-Frequency Handovers and Multi User Detection (MUD). Spectral spreading and scrambling codes along with processing gain (Gp) are also covered.

UMTS Network Architecture

- A description of the functions of the network elements within the UMTS system, which comprises the UMTS Radio Access Network (UTRAN) and the Core Network (CN) elements for both the Packet Switched (PS) and circuit switched (CS) elements. We describe the open interfaces, Uu, Iub, Iu, Iur, Gu, Cu, and the applications MAP, RANAP, and CAMEL, and include their protocol stacks and functions.

The UTRAN Physical Layer

- Here we outline the UMTS physical layer, from logical channels through transport channels to the actual physical channels in both uplink and downlink. The topics covered include user data transmission in both the uplink and the downlink on dedicated and shared channels with channel multiplexing. Additionally, signalling control channels and physical layer procedures are also described.

Radio Interface Protocols

- This section describes the layers 2 and 3 in detail. The major topics covered are Medium Access Control (MAC), Radio Link Control Protocol (RLC), Packet Data Convergence Protocol (PDCP) Broadcast and Multicast Protocol (BMC) and Radio Resource Control Protocol (RRC).

Duration - 2 Days

Aims – High speed packet access, sometimes known by mobile service providers as mobile broadband is the latest offering from service providers. This course will look at HSDPA and HSUPA as separate issues and discuss how service providers are implementing this technology. The aim of the course is to give delegates a very clear and comprehensive technical overview of these technologies. The course assumes a good appreciation of 3G technology. A one day 3G overview would be a pre-requisite.

Objectives - By the end of the course delegates will have a very clear understanding of how HSPA works and it's realistic capabilities and capacities.

Topics Include:

Introduction

- This introductory session will give an appreciation of why HSPA is a critical technology to 3G service providers and will compare and contrast it with other currently competing and future technologies such as WiFi, WiMAX and LTE. The current global deployments of HSDPA will also be considered.

3G Refresher

- A refresher of 3G Technology is given in order to ensure that all the pre-requisites for a firm understanding of HSDPA will be given. This will include Spreading Factor, Channelisation, Handover, Logical, Transport and Physical Channel.

HSDPA Introduction

- This section considers the new techniques introduced within HSDPA and gives a top level end to end appreciation of whole process and principle of High Speed Downlink Packet Access (HSDPA) as a useful pre-ambble before deep diving into these principles in more detail.

HSDPA Channels

- This section will give an understanding of all the additional logical channels introduced with HSDPA.

HSDPA Devices

- The types and characteristics of HSDPA Mobile Equipment is presented. This will consider the categories of device and the data rates that these will support.

HSDPA Channel Characteristics

- This section looks in a more detail at the principles introduced in the introductory section. The will include and appreciation of the MAC Architecture of HSDPA, the Hybrid ARQ (HARQ) mechanisms. Finally we will consider MIMO.

HSPA Mobility

- This section will consider the mobility issues with HSDPA and how a user in an active session will continue to be connected whilst on the move. This section will consider the Soft and Hard handover and Fast Cell Selection.

Network Impact

- The impact of HSDPA on the Iub and IuPS interfaces are considered in this section.

HSUPA

- The Uplink high speed channel will be considered here including new channels, techniques, mobility, data rates, functionality and network impact will be considered.

Duration - 2 Days

Aims - The majority of today's high speed networks employ optical technology at some point within the network. The physical transmission structure for the various optical technologies is often fibre optic cable. This course concentrates on the fibre optic cabling and associated components. This Fibre Optic course two day course covers principles and technology associated with the physical optical networking structure. A Knowledge of telecommunications is helpful, but not necessary. This course will provide a comprehensive insight into optical transmission and associated terminology.

Objectives - By the end of the course delegates will be able to define the properties of fibre optical transmission cables. In addition they will be able to explain the basic transmission principles of light over fibre and identify the major components of a Fibre optic network. Delegates will also be very comfortable in listing the major technologies which employ fibre optic transmission and fibre modes and effects of dispersion in optical fibre.

Topics Include:

Introduction

- This introductory session will introduce optical fibres and define the physical properties of light. Some of the core engineering principles will also be covered in this section, including, the basic principles of optical fibre waveguides, the physical and optical properties of optical fibres. Additionally the manufacture of optical fibres will be considered here.

Optical Components

- There are many different components involved with the transmission of optical signals. This section considers in more detail the use of optical fibres and defines the fibre components. Some of the components covered in this chapter include – Sources, Detectors, Transmitters, Receivers and positions them in the context of an Optical Fibre Communications Network.

Transmission Principles

- This section considers the properties and applications of Optical Fibre as it applied to the transmission systems in which it features. The Optical Fibre Applications are considered as is the mechanism for propagating light within an Optical Fibre cable. Optical Fibre wavelength is considered including the natural optical window and the ITU grid mechanism. The physical connectors used to terminate optical spans, and we look at why and where the physical terminations are found within Optical Transmission Systems.

Optical Technology

- Several types of Fibre Modes exist within networks today. Each has different properties and therefore lends itself to different applications. Some of the properties included within this section includes Optical Interfaces, Types of Dispersion, PMD Polarisation, Numerical Aperture, EDFA and Chirped Pulse WDM.

DWDM

- Dense Wavelength Division Multiplexing is part of every service providers strategy today. In this section we consider, what it is, how it works and plot an evolutionary path for its development. In this section we cover WDM Evolution, DWDM Principles, Lambda Switching and the future

Deployed Networks

- Having now covered all the theory some case studies are considered. Sample networks will be selected and a number of factors considered, including - Installation, Management Functions, Protection Issues and Network Architecture.

Duration - 2 Days

Aims - The majority of today's networks are moving towards an environment in which IP Multimedia Subsystem will play a central role as the core architecture of an all IP Environment. This course aims to educate delegates in the architecture and functionality of IMS infrastructure.

Objectives - By the end of the course delegates will have a clear understanding of the components, protocols, standards and procedural aspects of an IMS architecture. They will feel confident in getting involved with any technical discussion concerning IMS or related issues.

Topics Include:

Introduction

- Appreciation of the communications market trends in order to position IMS as a technology solution to the convergence conundrum. This section will document trends in both the mobile and fixed, voice and data markets.

IMS Introduction

- This section will introduce IP Multimedia Subsystem (IMS) through giving an appreciation of the components and basic functionality of an IP Multimedia Subsystem.

IMS Standards

- 3GPP/3GPP2 Specifications and a comparison between a generic IMS architecture and BT's 21CN.

Value Added Services

- This section examines the additional "sticky" services which become enabled through the deployment of an IMS and which will enable a service provider to increase average revenue per user whilst maintaining subscriber loyalty.

Protocols

- SIP and CAMEL are significant protocols within an IMS architecture environment. This section will consider how SIP functions within this environment and how it is used for session control, security and routing. In addition the course will consider the role of CAMEL and its basic functionality.

Architecture of UMTS IMS

- This section considers the reference architecture of an IMS environment and the various service layers which constitute this environment including – Application Layer, Service Control Layer and Media Layer.

Component Functions

- Overview of the main IMS components including CSCF, HSS, MGCF, MGW, P-CSCF, I-CSCF, S-SSCF, BGCF/MGCF, MRFC/MRFP, SCIM, OSA-SCS, IM-SSF Addressing.

IMS Scenarios

- An appreciation of the main functional scenarios associated with IMS including Registration (AAA Security), Call Origination/Termination, Charging, Security, Roaming and Handovers and Supplementary Services.

Duration - 2 Days

Aims – Carriers are looking to IPTV as a valuable revenue generator. The aim of this course is to take technical and non-technical personnel alike and educate them in the architecture, protocols, functionality and applications likely to dominate an IPTV environment.

Objectives - By the end of the course delegates will have a clear understanding on what an IPTV offering will look like, the components, functions and applications and finally how to trouble shoot it.

Topics Include:

Introduction

- This introductory session will introduce the notion of IPTV introducing the reasons why service providers are looking to offer IPTV and it's impact. It will focus on the importance of content over access. We will also consider key players found within the IPTV industry.

IPTV Systems Model

- This section will introduce the architecture of an IPTV environment including some of the components. It will concentrate on the equipment found within the Headend, Content Sources, Regional Metro Networks, Telco and Cable Access Networks and finally the Home Network. Broadcast, Unicast and Switched Digital Video will be considered here. In addition middleware vendors will be considered in detailing such issues as the Electronic Programming Guide.

IP Principles

- IP is the technology dominating this area of technology. This course will therefore consider the basics of IP including addressing, TCP/UDP Operation, RTP, RTCP, IGMPv3, PIM, RTSP and QoS management. Finally this section will consider Multimedia over IP including examples of how the Video Streaming works and how video is mapped into IP. Finally we consider some of the impediments to an IPTV flow and consider how channel changing works.

Digital Television and Video Compression

- Reducing the bandwidth required by Standard and High Definition video streams is critical to make IPTV economical. This section considers the nature of digital video and will focus on the need to compress it. This section will detail the principles underpinning MPEG2, MPEG4/AVC, MPEG7, and MPEG21 and Microsoft WMV10.

Technology Summary

- The technologies critical to the success of IPTV in the Core, Metro and Access networks will be summarised in this section so delegates have a clear understanding of the technology pre-requisites which must be in place to ensure an appropriate Quality of Experience (QoE) to the end user.

Copy Protection and Digital Rights Management

- As content ownership is so critical to differentiation within an IPTV environment we will consider how Digital Rights Management works and how data can be protected from copying, interception and syndication.

Deployed Networks

- This final section will consider currently deployed IPTV networks, their service offerings. We will also compare and contrast IPTV with Internet TV.



Training & Consultancy

Strategic Alliances

Strategic Alliances

In order to offer a broader single source portfolio of cutting edge training MAX Training has formed a strategic alliance with Optical Training and Technology



OTT have been a market leading brand for fibre and copper installation and testing courses since 1989.

Course Offerings

OTT courses include on-site and off-site training and offer the following types of courses, many of which are City and Guilds (C&G) accredited.

Fibre Installation

- Fibre Optic Cabling Installation in an external environment - C&G 3666-03
- Safe Working Practices and Principles of Comms Systems - C&G 3666-01
- Fibre Optic Cabling in an Internal Environment - C&G 3666-02

Fibre Testing

- Certified Fibre Characterisation Engineer (CFCE) Training Programme
- Advanced OTDR Testing of Fibre
- Advanced Testing of PMD and Chromatic Dispersion
- Advanced Testing of Fibre Optic Cabling for Data Communications

Copper Installation/Testing

- Copper Cabling in an Internal Environment - C&G 3666-04
- Advanced Testing of Copper for Data Communications

Why Source Through MAX Training?

Commercially - there is no difference.

Educationally we can combine the expertise of OTT and MAX Training in order to offer a blended learning solution which addresses all the training issues in one hit.

This can therefore include both a consideration of the physical layer fibre issues to an analysis of the technologies, protocols and applications which ride as bit streams over them.



Training & Consultancy

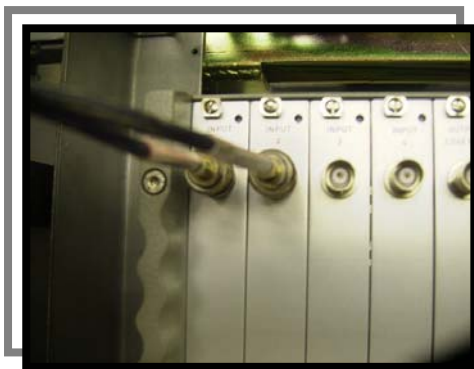
Product Courses

Product Courses

MAX Training can offer product training to Vendors and Service providers alike. We have the capability to teach on virtually any piece of communications equipment.

Training departments have become profit centres. The challenge is therefore to drive down costs and yet maintain quality.

MAX Training can benefit your company with massive savings whilst offering you infinite flexibility with no compromise to quality.



Business Benefits For The Vendor;

- You call on MAX Training when necessary thereby reducing overhead costs.
- Course quality and product knowledge are our responsibility, allowing your existing trainers to concentrate on other projects.
- You keep control of training costs.

Business Benefits To Service Providers;

- Cost savings from having shorter courses as training is 100% focussed on your network.
- Cost savings as we come to you, so your travel and accommodation overheads are significantly reduced and engineers are available for emergency outages
- More skilled and motivated workforce as a greater number of engineers are trained from the same training budget.

Product expertise includes;

- **Optical Transmission Equipment**
- **Data Switching Equipment**
- **Layer 3 Routing Equipment**
- **Layer 1,2 & 3 Testing and Monitoring equipment**





Training & Consultancy

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