Course TCP-401: Programming with TCP/IP

Course Description:
TCP/IP is the de facto standard for internetworking heterogeneous networks and is increasingly finding application in real-time and embedded systems.

This course presents the TCP/IP architecture and describes in detail how to develop client server applications that inter-operate over TCP/IP networks.

Delegates will be provided with the necessary knowledge of how these protocols may be used and applications developed.

This course has a number of practical exercises which are undertaken in a Unix/Linux (BSD) environment.

Overview:
A four-day course providing an introduction to the TCP/IP architecture and programming API at level of detail that allows application programmers to utilise the features to develop high performance, scalable distributed applications. 50% of the course is spent developing distributed applications.

Course Objectives:
After completing the course attendees will:

- Appreciate the architecture of the TCP/IP protocol suite
- Develop client/server applications that work over TCP/IP
- Understand and use the BSD sockets API
- Understand and be able to apply the different architectures for distributed applications using TCP/IP.

Pre-requisites:
Knowledge of the C programming language. No knowledge of TCP/IP is assumed.

Who should attend:
Hardware and software engineers who will be developing TCP/IP applications.

Duration:
Four days

Course Material:
Delegate handbook.

Course Outline:

Introduction
- TCP/IP Layering
- Internet Addresses
- The Domain Name System
- Client-Server Model
- Port Numbers

Link Layer
- Ethernet and IEEE 802 Encapsulation
- PPP: Point-to-Point Protocol

IP: Internet Protocol
- IP Header
- IP Routing
- Subnet Addressing,
- ARP: Address Resolution Protocol
- DHCP: Dynamic Host Configuration Protocol
- ICMP: Internet Control Message Protocol
- IPV6

IP Routing
- Routing Principles
- Dynamic Routing Protocols
- RIP: Routing Information Protocol, RIP Version 2
- OSPF: Open Shortest Path First

UDP: User Datagram Protocol
- UDP Header
- UDP messages
- UDP applications

TCP: Transmission Control Protocol
- TCP services
- TCP header
- TCP connection management
- TCP data flow
- TCP performance and features

Connection-Oriented Application Development
- The TCP/IP Socket model
- Establishing a connection
- Performing data transfer
- Client programming
- Server programming

Connectionless Application Development
- UDP Programming
- Data transfer
- Broadcasting and multicasting

Concurrency
- Processes and threads
- Posix threads
- Concurrent servers
- Data protection
- Using select to achieve concurrency

Client/Server application Architecture
- Connectionless/connection-oriented I/O models
- Multithreaded vs multi-process
- application designs

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