TCP/IP Fundamentals Training

Duration: **3 Day**

BILGINC IT Academy
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Overview

Newly upgraded and with a new extended security section, this is the essential course for anyone who needs a solid understanding of TCP/IP networks. The course describes and explains the concepts and features of TCP/IP, providing a complete introduction to the TCP/IP protocols, services and applications. Assuming no existing TCP/IP knowledge, it covers all aspects of TCP/IP, the Internet and Intranets, including security issues. Common user and system applications are explained (including FTP, Telnet, WWW, DNS, NFS, and SNMP), in addition to a detailed examination of the major protocols, message formats and addressing methods.

Attendees will construct and configure a small routed network and also participate in network intrusion. These practical exercises reinforce the topics and skills taught during the course.

Prerequisites

An understanding of networking principles and terminology is required.

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What You Will Learn

- describe the main objectives of the TCP/IP protocols
- explain the structure and use of IP addresses
- distinguish between an application and a protocol
- identify TCP/IP message formats
- explain what port numbers are and why some are well known
- understand the importance of RFCs and state how they may be obtained
- explain how IP routing operates and how messages are delivered to the right node
- understand the function, purpose, and use of subnetting, and be able to specify suitable subnet masks for given implementations
- describe how the FTP application operates and how it can be used
- explain how the Telnet, TN3270, and TN5250 applications operate and how they can be used
- explain how email applications operate and how mail is transported to the correct node using the SMTP and POP3 protocols
- explain how the world wide web application operates
- explain how the domain name system operates and how name servers resolve domain names
- explain the purpose and operation of the network file system and how it can be used
- explain the purpose and use of the SNMP protocol and how it can be used for network management
- describe how TCP operates and how connections are established, used, and terminated
- explain retransmission, sliding windows, and out of band data
- describe how UDP operates
- describe the function of routing protocols and state why they are required
- explain fragmentation and reassembly, source routing, RIP, and OSPF
- explain the purpose of CIDR and describe how it operates
- describe the purpose and function of the ICMP protocols and give examples of their use
- describe the purpose and function of the ARP protocol and state why it is required
- describe the purpose and use of the RARP protocol and describe its relationship to the BootP and DHCP protocols
- explain how a TCP/IP network can be installed, configured, tested, and managed
- explain how public/private key encryption techniques work
- describe the contents and use of a Digital Certificate
- state the purpose of the Secure Sockets Layer
- describe the principles of Firewalls
- explain the terms “packet filtering” and “bastion host”
- describe the use and output of the Netstat command
- describe the vulnerabilities of a computer system and network
- describe the defensive techniques to protect against threats
- use a packet sniffer tool to extract information from captured packets.

Outline

Introduction to TCP/IP

What is TCP/IP?; Why TCP/IP?; The growth of the Internet; Internetworking principles; IP addressing; IP address and physical address; Internet domain names; Internet domain name hierarchy; TCP/IP protocols; Common user applications; Common system applications; 'The Next Generation'; Review questions.

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Architecture & Operation

Requests For Comments (RFCs); Protocol boundaries; Port numbers; Message formats; Transport & network protocols; A tale of two transports; Principles of IP routing; The structure of the Internet; Review questions.

User-Oriented Applications

Client/Server applications; Addressing the server; Berkeley Sockets; A TCP communication; A UDP communication; The File Transfer Protocol application; Using FTP; The Telnet application; Using Telnet; The Simple Mail Transfer Protocol; The Post Office Protocol v3; Using SMTP and POP3; The World Wide Web application; Using the Web; Review questions.

System-Oriented Applications

Resolving Internet domain names; The Domain Name System; Domain Name resolution; The Network File System; The Network File System architecture; The Network File System in operation; The Network File System port numbers; Network management - problems; Simple Network Management Protocol; Network management - solution; Review questions.

Transport Level Protocols

TCP and UDP compared; Transport Level message formats; UDP datagram format; UDP checksum pseudo-header; UDP in action; TCP segment format; TCP checksum pseudo-header; Connection set-up and release; Sequence numbers; Segment acknowledgement; TCP reliability; TCP sliding windows; Sliding windows in action; TCP control flags; TCP segment format - review; TCP finite state machine; Establishing a TCP connection; TCP data transfer; TCP connection release; Review questions.

Network Level Protocols

The Network Level Protocols; IP services; IP address classes; Subnetting principles; Subnetting mechanism; Subnetting in action; IP datagram format; Fragmentation & reassembly; Type Of Service; Time to live; IP options format; IP options - source routing; IP options - record route & time stamp; IP routing - principles; Interior and exterior routing protocols; Routing protocol location; OSPF & RIP compared; The IP routing algorithm; IP datagram format - review; address space exhaustion; Classless Inter-Domain Routing; CIDR in action; Classless addressing; Internet Control Message Protocol; ICMP message format; Example ICMP messages; Address Resolution Protocol; ARP message format; ARP in action; Reverse Address Resolution Protocol; RARP in action; RARP message format; The Bootstrap Protocol; BootP message format; BootP in action; The problem with BootP; Dynamic Host Configuration Protocol; DHCP message format; DHCP finite states; DHCP and domain names; Review questions.

Configuring & Managing a TCP/IP Network

Setting up a TCP/IP host; Network infrastructure; Interconnection devices; TCP/IP addressing & naming; Choosing names & addresses; Security & privacy; Firewalls & encryption; Public key encryption - principle; Public key encryption - capabilities; Digital certificates; Secure Sockets Layer; Firewalls - packet filtering; Firewalls - bastion host; Firewalls - screened subnet; Network management - ping; Network management - Netstat; Review questions.

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Network Security

Introduction; Vulnerabilities; The user; The user's operating system; Software running on the user's system; Lack of security in the communicating protocol; An inherent weakness of the network the user is on; Wireless networks; Internet based threats; Defense; Firewalls; Intrusion Prevention; Anti-virus software; Updates and Patches; User education; Tools; Wireshark; Backtrack; Metasploit/Armitage; Social Engineering Toolkit (SET).

IPv6 - The Next Generation

Why IPv6?; IPv6 packet format; IPv6 header format; Extension Headers; IPv6 Routing Header; IPv6 fragmentation header; IPv6 options header; IPv6 addressing; IPv6 prefixes and address types; Global unicast address format; Anycast address; Multicast address.