

# TCP/IP in a Day

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## CONTENTS

This course aims at filling in all the knowledge gaps for people working in a technical environment where the TCP/IP suite of protocols is used. Frequently modern telecommunications engineers can be experts in higher layer functions and protocols while at the same time missing some of the foundation that TCP/IP provides.

The lectures are placed in an order such that you can view them all in sequence as one consistent course. You may also need to focus more on some topics than others, or maybe you are already an expert in some aspects of TCP/IP. In that case it is possible to just skip to the lectures that interest you the most. You will not need to pass any test to proceed from one topic to the next.

## PREREQUISITES

General technical telecommunications knowledge is beneficial but not required.

Note: FoldOuts are not used in this training.

## Introduction

- The Protocol architecture – What is a stack?
- Different protocols in the same message
- The Telecom vs the Datacom approach

## Ethernet

- Why does Ethernet exist?
- CSMA (CA and CD)
- Hubs vs switches
- MAC addresses
- LAN/WAN/PAN/GAN
- ARP Protocol

## The IP Protocol

- The main IP functions of IP
- Description of the IP header fields
- Routers

## Addressing

- IPv4 address format
- Network masks
- Default gateways
- Network part and local part of addresses
- CIDR and slash-notation
- Public and private IP addresses
- Subnetting
- IP address assignment, RIR and LIR
- NAT/PAT

## VLAN

- The function of Virtual LAN
- The 802.1q tag format

- VLAN tables (ingress/egress)

## ICMP

- Functions of the ICMP protocol
- Echo/echo reply (Ping)
- Destination unreachable
- Time exceeded
- Traceroute

## IPv6

- IPv4 vs IPv6
- IPv6 header format
- SLAAC and DHCPv6
- IP Routing
- Static routing versus dynamic routing
- Routing functions
- Routers vs hubs and switches
- Routing tables
- Routing protocols
  - RIP
  - OSPF
  - BGP
- Autonomous Systems (AS)

## Multicast

- The purpose of multicast
- Multicast vs unicast and broadcast
- IPv4 multicast addresses
- IGMP

## QoS in IP Networks

- QoS technologies
- Latency/Jitter/Throughput
- DiffServ (DSCP)
- MPLS
- Ethernet 802.1p header
- P.800 MOS values

## Security

- IP security methods
- IPSEC
- SSL/TLS, HTTPS
- Intrusion detection
- Encryption and digest authentication

## IP in Mobile Networks

- IP in 3G (GPRS) – PDP Contexts
- IP in 4G (UMTS) – PDN Connections
- IP in 5G – PDU Sessions

## **TCP, UDP and SCTP protocols**

- Ports and port numbers
- Connection-oriented vs connectionless
- Session establishment
- Reliability
- Sequence number / Acknowledge number
- Retransmissions
- Sessions and associations

## **Realtime traffic on an IP media**

- VoIP signalling
- SIP
- RTP and RTCP
- RTSP

## **IP Applications**

- DNS
- DHCP
- E-mail, SMTP/POP/IMAP
- FTP (file transfer)

## **Internet Access**

- What is the Internet?
- ISPs
- Internet Exchange - IX
- The authorities of the Internet
- Peering and Transit
- International data transport

## **Summary**