1 Chapter 3

Begriff	Beschreibung
SNB	Server Message Block (kurz SMB, teils auch als LAN-Manager- oder NetBIOS-Protokoll bekannt) ist ein **Kommunikationsprotokoll** für **Datei-, Druck- und andere Serverdienste** in Netzwerken. Es ist der Kern der Netzwerkdienste von **Microsofts LAN Manager**, der Windows-Produktfamilie, sowie des LAN-Servers von IBM. Weiter wird es auch von der frei verfügbaren Software Samba und Samba-TNG verwendet, um Windows-Systemen den Zugriff auf Ressourcen von UNIX-basierten Systemen zu ermöglichen und umgekehrt.
Gnutella protocol	• Filesharing übers Internet • Beispiele: BearShare, Gnucleus, LimeWire, Morpheus, WinMX and XoloX
Telnet	• Verbindung wird «Virtual Terminal (VTY) session, or connection» genannt • SSH → Verschlüsselung für Telnet. Sollte man immer benutzen.

2 Chapter 4

Begriff	Beschreibung

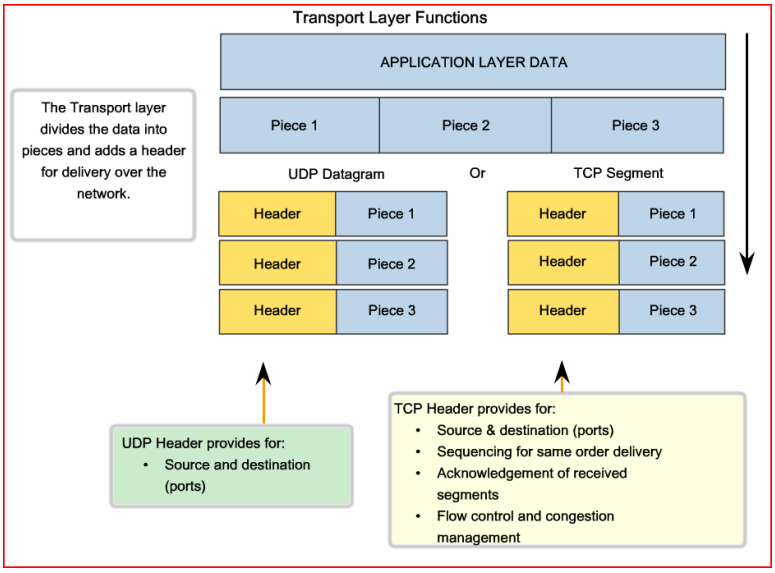
Transport Layer (4)
 	
Allgemein
	• Ermöglicht mehreren Applikationen mit dem Netzwerk zu kommunizieren (Email, Instant Messaging, Browsing etc)
	  ○ Ziel- und Endhost
	  ○ Conversation Multiplexing genannt
	• Dass die Daten sauber zu den Applikationen vermittelt werden → Zuordnung via Port-Nummer
	• Beschäftigt sich mit Fehlerhandling
	  ○ Error Checking
	• **Segmentiert** Daten und fügt diese wieder zusammen
	  ○ Segmentation and Reassembly

UDP	User Datagramm Protocol • Verbindungslos • Header kleiner (nur 8 Byte) • Geeignet für Applikationen, wo **Genauigkeit unwichtig** ist (VoIP, Video-Stream, DNS) • Einheit wird **Datagramm** genannt
TCP	Transmission Control Protocol • Verbindungsorientiert • Header grösser (20 Byte) • Geeignet für Applikationen, wo **Genauigkeit wichtig** ist (Email, Browser, File-Transfer) • Einheit wird **Segment** genannt
Socket	IP-Adresse + Port → eindeutig! z.B: 192.168.1.20:80
Zuständig	Internet Assigned Numbers Authority (IANA). Ist eine Organisation

Port Number Range	Port Group
0 to 1023	Well Known (Contact) Ports
1024 to 49151	Registered Ports
49152 to 65535	Private and/or Dynamic Ports

Netstat

Befehl, welcher die momentan benutzten Ports anzeigt

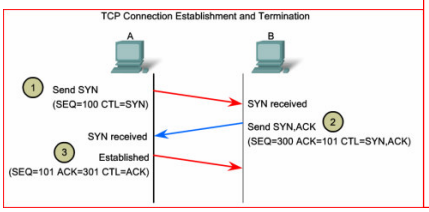


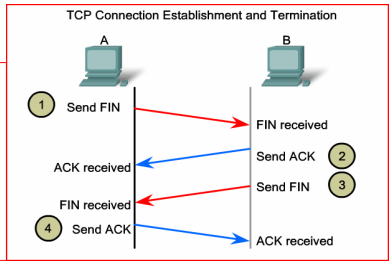
Three-way-handshake

- Sichert, dass Endgerät bereit ist im Netzwerk
- Sichert, dass das Endgerät bereit ist im Netzwerk auf dem entsprechenden Port Daten aufzunehmen
- Informiert das Endgerät über den Datenverkehr

Werte im Header des TCP

- URG - Urgent pointer field significant
- ACK - Acknowledgement field significant
- PSH - Push function
- RST - Reset the connection
- SYN - Synchronize sequence numbers
- FIN - No more data from sender



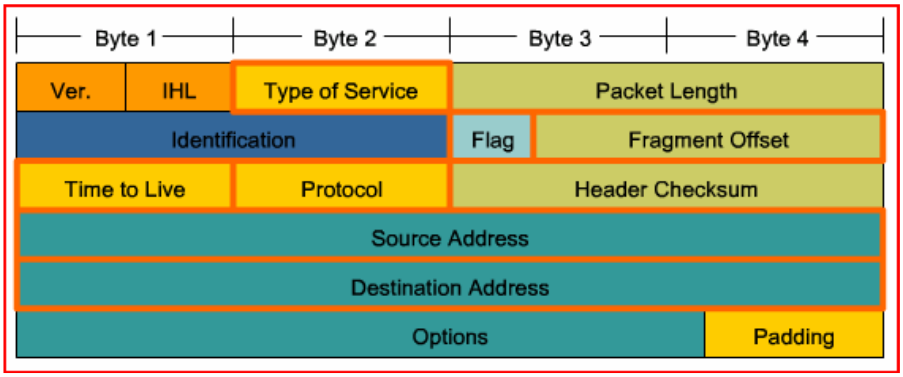


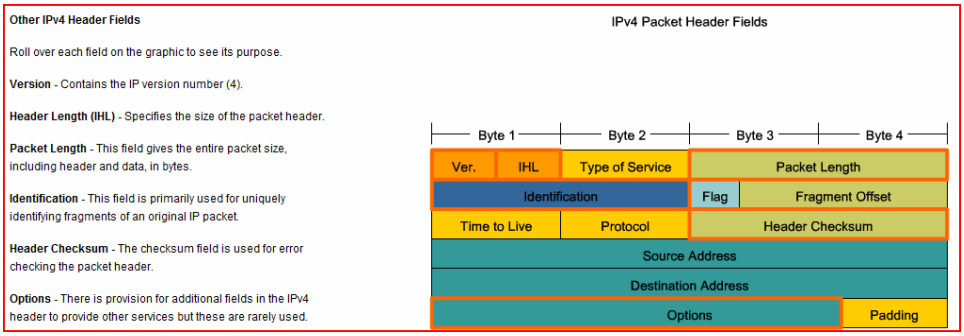
UDP

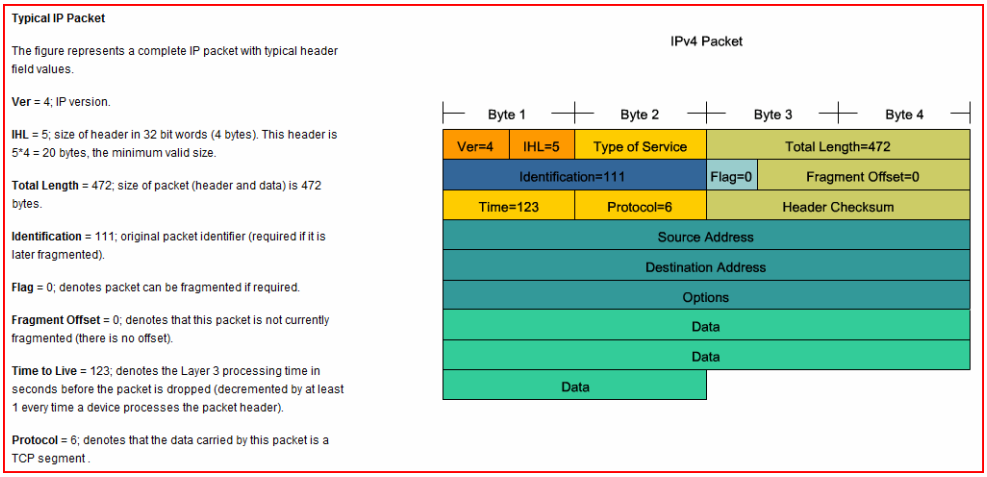
Verbindungslos, weniger Overhead. Wird gebraucht für folgende Applikationen:

- Domain Name System (DNS)
- Simple Network Management Protocol (SNMP)
- Dynamic Host Configuration Protocol (DHCP)
- Routing Information Protocol (RIP)
- Trivial File Transfer Protocol (TFTP)
- Online games
- Voip, Videostreams

3 Chapter 05

Begriff	Beschreibung
Hauptfunktion	• Addressing • Encapsulation • Routing • Decapsulation
Routing	• Router leitet die Pakete über Netzwerke hinweg auf dem schnellsten Weg zum Ziel (Metrik)
Routingfähige Protokolle	• Internet Protocol version 4 (IPv4) • Internet Protocol version 6 (IPv6) • Novell Internetwork Packet Exchange (IPX) • AppleTalk • Connectionless Network Service (CLNS/DECNet)
IPv4 Eigenschaften	• Connectionless - No connection is established before sending data packets. • **Best Effort** (**unreliable**) - No overhead is used to guarantee packet delivery. • Media Independent - Operates independently of the medium carrying the data. **Unreliable** means simply that IP does not have the capability to manage, and recover from, undelivered or corrupt packets. • Kümmert sich nicht um die Zuverlässigkeit → garantiert keine Zustellung • Kümmert sich nicht um das Medium
MTU	• Beschreibt die maximale Grösse, die ein Paket (Layer 3) haben darf, ohne dass das Paket fragmentiert werden muss. Im Bezug auf eine Leitung.
IP Header	Enthält folgende daten • IP Source Address • IP Destination Address • Time-to-Live (TTL) • Type-of-Service (ToS) → Priorisierung • Protocol • Fragment Offset • More Fragment Flag (wenn = 1 → noch nicht letzetes Fragment) 





Gründe für Netzteilung in Subnetze	• Geographic location • Purpose • Ownership Gründe • Performance degradation • Security issues • Address Management
Wegleitung	• Paket muss nicht wissen, welche Adresse der Zielhost hat → nur Gateway • Next-Hop-Adresse → Adresse des nächsten Routers • 5.3.2.1 **Jeder Route**r nimmt Paket auseinander (Entkapsel des Layer 2 Headers) und untersucht dieses. Anschliessend setzt er es wieder zusammen.
Inhalt Routing-Table	• Destination network • Next-hop • Metric

4 Chapter 6

Begriff	Beschreibung
Broadcast	Wird verwendet für: • Mapping upper layer addresses to lower layer addresses • Requesting an address • Exchanging routing information by routing protocols
Multicast	Wird verwendet für : • Video and audio distribution • Routing information exchange by routing protocols • Distribution of software • News feeds
Reservierte Adressen	Reserved IPv4 Address Ranges Type of Address / Usage / Reserved IPv4 Address Range / RFC Host Address — used for IPv4 hosts — 0.0.0.0 to 223.255.255.255 — 790 Multicast Addresses — used for multicast groups on a local network — 224.0.0.0 to 239.255.255.255 — 1700 Experimental Addresses — • used for research or experimentation • cannot currently be used for hosts in IPv4 networks — 240.0.0.0 to 255.255.255.254 — 1700 3330
Private Adressen	• **10**.0.0.0 to **10**.255.255.255 (10.0.0.0 /8) • **172.16**.0.0 to **172.31**.255.255 (172.16.0.0 /12) • **192.168**.0.0 to **192.168**.255.255 (192.168.0.0 /16)
Spezielle IP-Adressen (können nicht vergeben werden)	• Network- und Broadcast Adresse • Default Route: 0.0.0.0 - 0.255.255.255 (0.0.0.0 /8) • Loopback: 127.0.0.1 ○ Obwohl nicht benutzt, trotzdem auch: 127.0.0.0 to 127.255.255.255 • *Link-Local Adressen: 169.254.0.0 to 169.254.255.255 (169.254.0.0 /16) • *Test-net Adressen: 192.0.2.0 to 192.0.2.255 (192.0.2.0 /24) **(*) nur innerhalb des Netzwerkes**

Adress-Klassen

Address Class	1st octet range (decimal)	1st octet bits (green bits do not change)	Network(N) and Host(H) parts of address	Default subnet mask (decimal and binary)	Number of possible networks and hosts per network
A	1–127**	00000000–01111111	N.H.H.H	255.0.0.0	128 nets (2^7) 16,777,214 hosts per net (2^24–2)
B	128–191	10000000–10111111	N.N.H.H	255.255.0.0	16,384 nets (2^14) 65,534 hosts per net (2^16–2)
C	192–223	11000000–11011111	N.N.N.H	255.255.255.0	2,097,150 nets (2^21) 254 hosts per net (2^8–2)
D	224–239	11100000–11101111	NA (multicast)		
E	240–255	11110000–11111111	NA (experimental)		

Planung Netzwerk

Kriterien:
- Preventing duplication of addresses
- Providing and controlling access
- Monitoring security and performance

IANA

Internet Assigned Numbers Authority (IANA)
- Hauptverantwortlich für Vergabe der IP-Adressen weltweit

RIR

Regional Internet Registries (RIRs)
- Regionale Internet Register

IPv6

Man hat sich Gedanken gemacht über:
- Improved packet handling
- Increased scalability and longevity
- QoS mechanisms
- Integrated security

To provide these features, IPv6 offers:
- 128-bit hierarchical addressing - to expand addressing capabilities
- Header format simplification - to improve packet handling
- Improved support for extensions and options - for increased scalability/longevity and improved packet handling
- Flow labeling capability - as QoS mechanisms
- Authentication and privacy capabilities - to integrate security

Subnetze

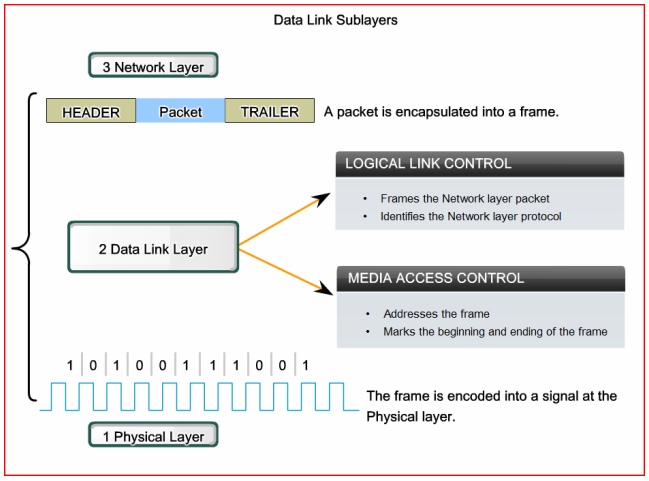
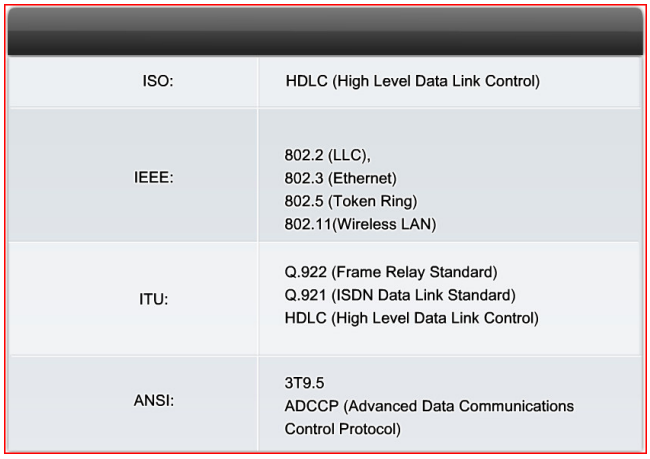
Aufgrund folgender Überlegungen:
- Grouping based on common geographic location
- Grouping hosts used for specific purposes
- Grouping based on ownership

Traceroute

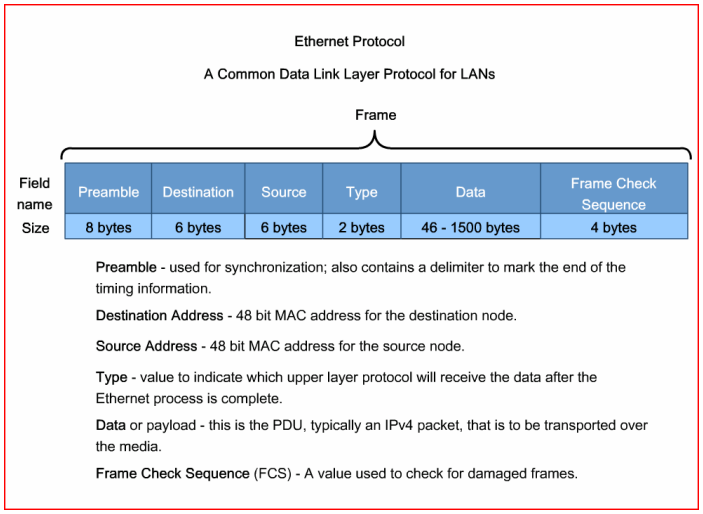
Round Trip Time (RTT)
Time to Live (TTL)

ICMP	ICMP messages that may be sent include:
	• Host confirmation
	• Unreachable Destination or Service
	  ○ 0 = net unreachable
	  ○ 1 = host unreachable
	  ○ 2 = protocol unreachable
	  ○ 3 = port unreachable
	• Time exceeded
	• Route redirection
	• Source quench

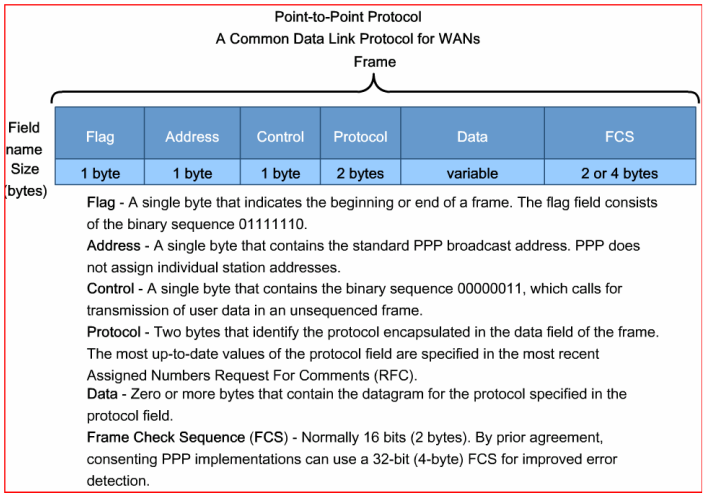
5 Chapter 7 (Layer 2 – Data-Link-Layer)

Begriff	Beschreibung
Sublayer	
Standards	
Kollisions-mehtoden	Controlled (Verkehr wird kontrolliert, keine Kollision, viel Overhead) • FDDI • Token Ring Contention-based (CSMA/CD, CSMA,CA) • WLAN • Ethernet

Logical Topologies	Muss nicht zwingend mit der physischen Topologie übereinstimmen. Tut es aber meistens.
	Folgende Topologien werden auf Layer 2 verwendet:
	• **Point-to-Point** (Direktverbindung)
	  ○ Auch wenn Router dazwischen geschaltet sind, handelt es sich um eine logische Direktverbindung
	• **Multi-Access** (Bus)
	  ○ CSMA/CD, CSMA/CA für «balance between frame control, frame protection, and network overhead.»
	• **Ring**
	  ○ Sendet nur, wenn an der Reihe

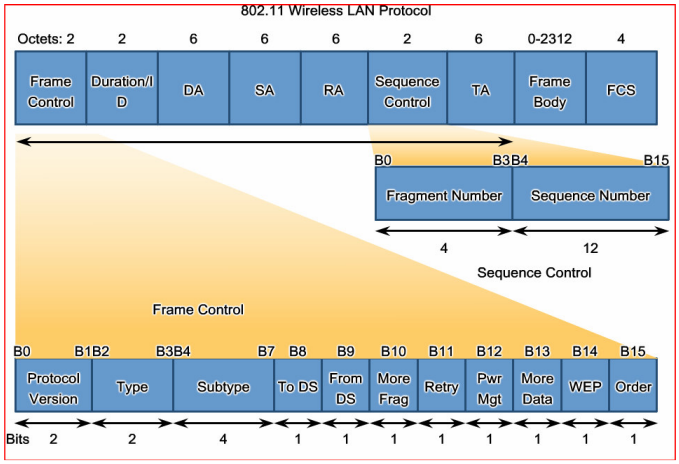
Frame Header	Typical frame header fields include: • **Start Frame field** - Indicates the beginning of the frame • **Source and Destination address fields** - Indicates the source and destination nodes on the media • **Priority/Quality of Service field** - Indicates a particular type of communication service for processing • **Type field** - Indicates the upper layer service contained in the frame • **Logical connection control field** - Used to establish a logical connection between nodes • **Physical link control field** - Used to establish the media link • **Flow control field** - Used to start and stop traffic over the media • **Congestion control field** - Indicates congestion in the media
Protokolle (Layer 2)	• **Ethernet** • Point-to-Point Protocol (**PPP**) • High-Level Data Link Control (**HDLC**) • **Frame Relay** • Asynchronous Transfer Mode (**ATM**)
Ethernet Protocol	

PPP



Flag - A single byte that indicates the beginning or end of a frame. The flag field consists of the binary sequence 01111110.
Address - A single byte that contains the standard PPP broadcast address. PPP does not assign individual station addresses.
Control - A single byte that contains the binary sequence 00000011, which calls for transmission of user data in an unsequenced frame.
Protocol - Two bytes that identify the protocol encapsulated in the data field of the frame. The most up-to-date values of the protocol field are specified in the most recent Assigned Numbers Request For Comments (RFC).
Data - Zero or more bytes that contain the datagram for the protocol specified in the protocol field.
Frame Check Sequence (FCS) - Normally 16 bits (2 bytes). By prior agreement, consenting PPP implementations can use a 32-bit (4-byte) FCS for improved error detection.

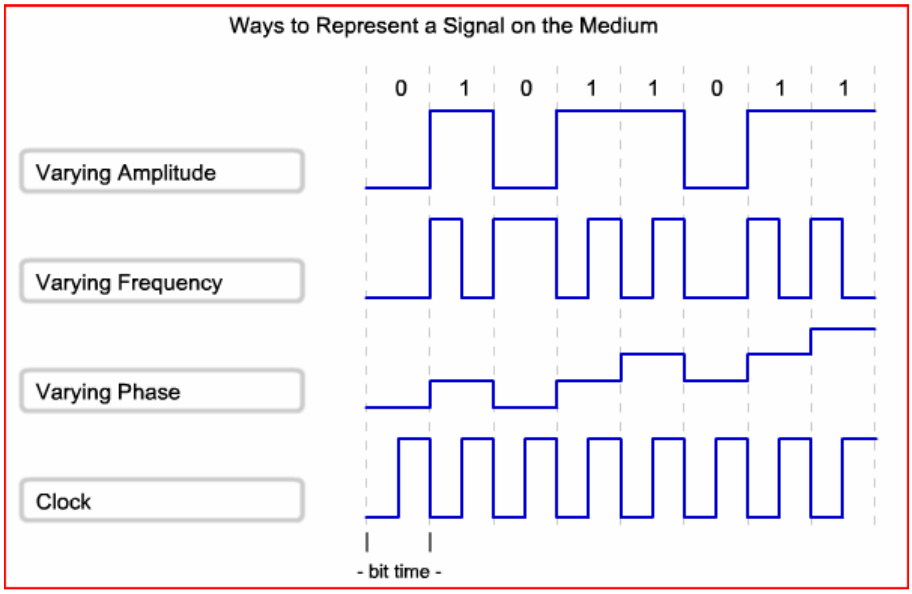
WLAN-Protokoll



6 Chapter 8 (Layer 1 – Physical Layer)

Begriff	Beschreibung
Notwendige Layer 1 Elemente	• The physical media and associated connectors • A representation of bits on the media • Encoding of data and control information • Transmitter and receiver circuitry on the network devices
Zweck	The **purpose** of the Physical layer is to create the electrical, optical, or microwave signal that represents the bits in each frame
3 Basisformen der Netzwerk-medien	• Copper cable (Pattern of electical pulses) • Fiber (Pattern of light) • Wireless (Pattern of Radio transmission)
Organisationen	• The International Organization for Standardization (**ISO**) • The Institute of Electrical and Electronics Engineers (**IEEE**) • The American National Standards Institute (**ANSI**) • The International Telecommunication Union (**ITU**) • The Electronics Industry Alliance/Telecommunications Industry Association (**EIA/TIA**) • National telecommunications authorities such as the Federal Communication Commission (**FCC**) in the USA. **Analog Layer 2 – Data-Link-Layer**
Technologien und Hardware	Signale • Art der Übertragung (Wellen) Stecker • Z.B : RJ45 Kabel
Funktionen Layer 1	• The physical components (Medium) • Data encoding (Aus Signale macht er 1/0) • Signaling (Umwandeln der 1/0 für Leitung)

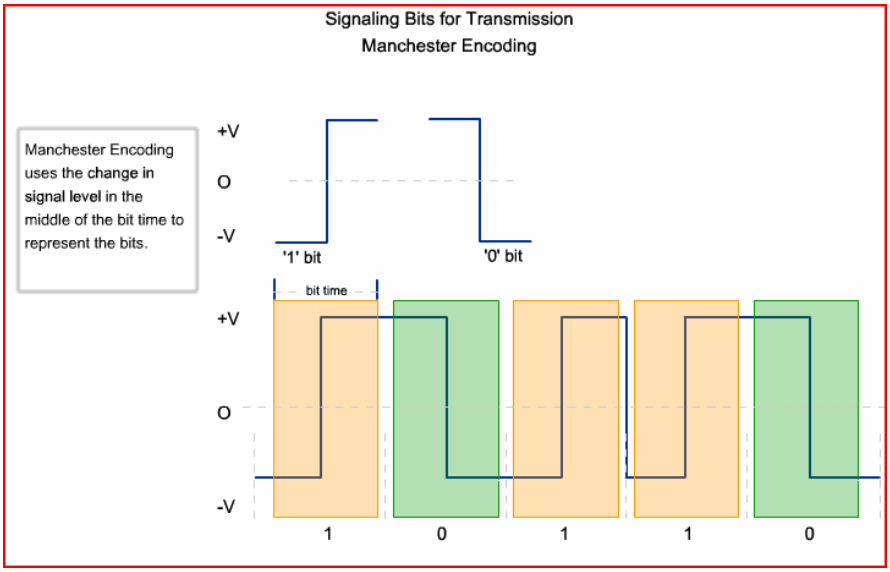
Bit-Time



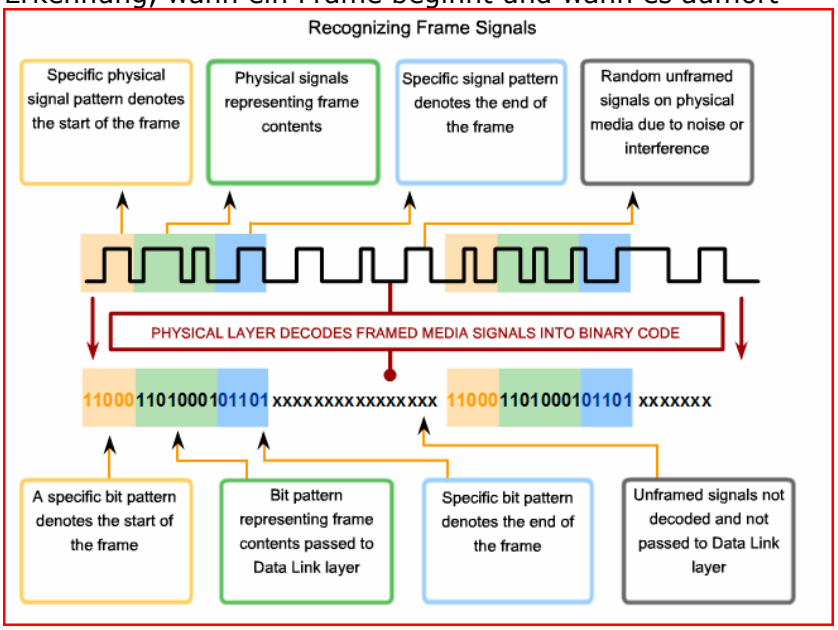
Varying Amplitude / NRZ-Signals (**N**on-**R**eturn to **Z**ero)

- Nur für langsame Medien geeignet, da lange Folge von 0en oder 1en ungenau wird

Manchaster Encoding



Although Manchester Encoding is not efficient enough to be used at higher signaling speeds, it is the signaling method employed by 10BaseT Ethernet (Ethernet running at 10 Megabits per second).

Grouping Bits	Erkennung, wann ein Frame beginnt und wann es aufhört  **Bei schnellen LANs verbreitet**
Code Gruppen	Vorteile • Reducing bit level error • Limiting the effective energy transmitted into the media • Helping to distinguish data bits from control bits • Better media error detection 3 Arten von Symobolen • **Data symbols** - Symbols that represent the data of the frame as it is passed down to the Physical layer. • **Control symbols** - Special codes injected by the Physical layer used to control transmission. These include end-of-frame and idle media symbols. • **Invalid symbols** - Symbols that have patterns not allowed on the media. The receipt of an invalid symbol indicates a frame error.
Datentransfer	Kann gemessen werden auf drei Arten : • **Bandwidth** (alle Daten, Bits) • **Throughput** (Throughput is the measure of the transfer of bits across the media over a given period of time) → eigentliche Daten, ohne Header etc • **Goodput** (Goodput is the measure of **usable** data transferred over a given period of time, and is therefore the measure that is of most interest to network users.)

Ethernet Medien

Physical Media - Characteristics

Ethernet Media

	10BASE-T	100BASE-TX	100BASE-FX	1000BASE-CX	1000BASE-T	1000BASE-SX	1000BASE-LX	1000BASE-ZX	10GBASE-ZR
Media	EIA/TIA Category 3, 4, 5 UTP - four pair	EIA/TIA Category 5 UTP - two pair	50/62.5 mmulti mode fiber	STP	EIA/TIA Category 5 (or greater) UTP, four pair	50/62.5 micron multimode fiber	50/62.5 micron multimode fiber or 9 micron single mode fiber	9m single mode fiber	9m single mode fiber
Maximum Segment Length	100m (328 feet)	100m (328 feet)	2 km (6562 ft)	25 m (82 feet)	100 m (328 feet)	Up to 550 m (1,804 ft) depending on fiber used	550 m (MMF)10 km (SMF)	Approx. 70 km	Up to 80 km
Topology	Star	Star	Star	Star	Star	Star	Star	Star	Star
Connector	ISO 8877 (RJ-45)	ISO 8877 (RJ-45)		ISO 8877 (RJ-45)	ISO 8877 (RJ-45)				

Wireless Medien

Physical Media - Characteristics

Wireless Media

Standards	Bluetooth 802.15	802.11(a,b,g,n), HiperLAN 2	802, 11, MMDS, LMDS	GSM, GPRS, CDMA, 2.5- 3G
Speed	<1 Mbps	1 - 54 + Mbps	22 Mbps+	10- 384 Kbps
Range	Short	Medium	Medium- long	Long
Applications	Peer-to-peer device-to-device	Enterprise networks	Fixed, last mile access	PDAs, Mobile phones, Cellular access

Copper Medien

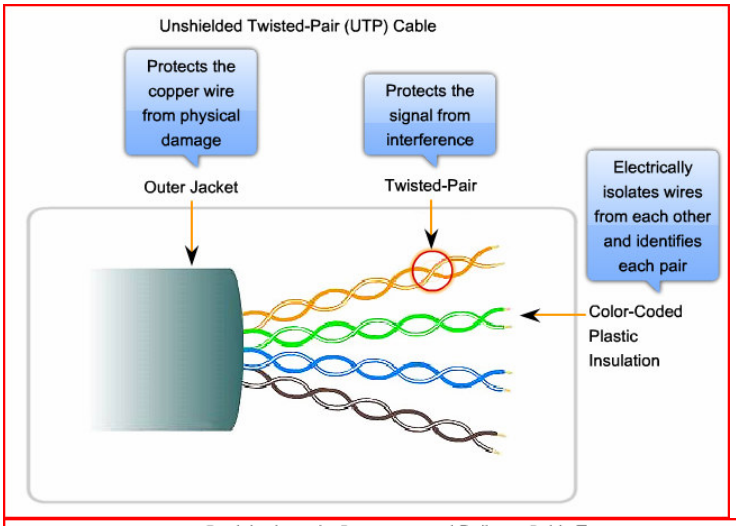
- Koaxialkabel
- Unshieldet Twisted Pair
- RJ45 Connections

Sind anfällig auf Störungen (Interferenzen) (Florescenz-Röhren, Elektromotoren, Radiowellen). **Abhilfe** schaffen:

- **Selecting** the **cable** type or category **most** suited to protect the data signals in a given networking environment
- **Designing** a **cable infrastructure** to **avoid known and potential** sources of interference in the building structure
- Using **cabling techniques** that include the proper handling and termination of the cables

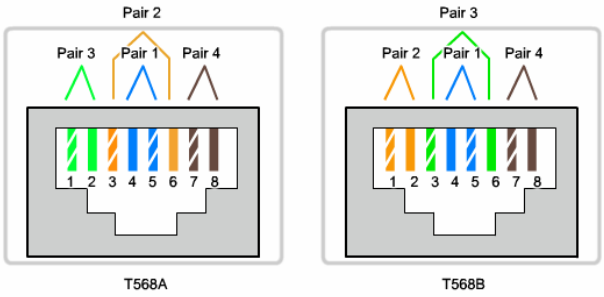
UTP

Unshielded Twisted Pair

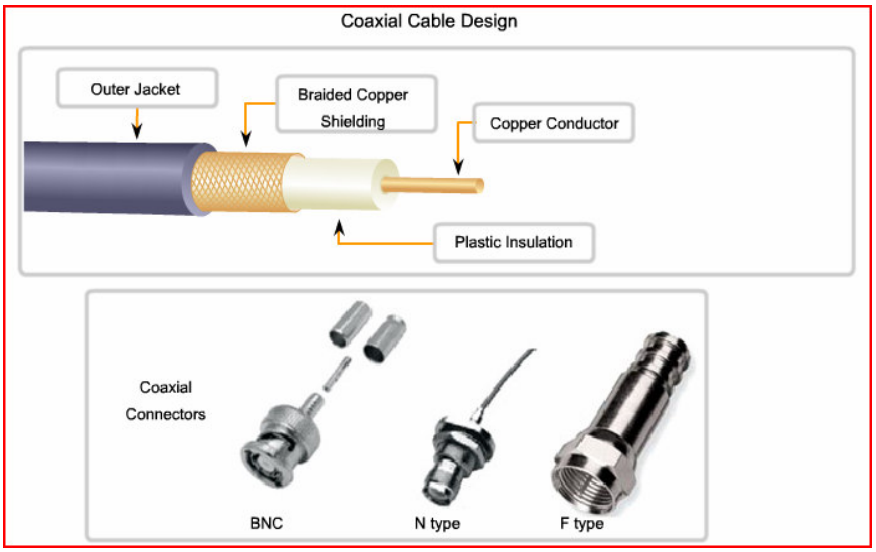


Straight-through, Crossover, and Rollover Cable Types

Cable Type	Standard	Application
Ethernet Straight-through	Both end T568A or both end T568B	Connecting a network host to a network device such as a switch or hub.
Ethernet Crossover	One end T568A, other end T568B	Connecting two network hosts. Connecting two network intermediary devices (switch to switch, or router to router).
Rollover	Cisco proprietary	Connect a workstation serial port to a router console port, using an adapter.



Coaxial Cable



Verwendet für :

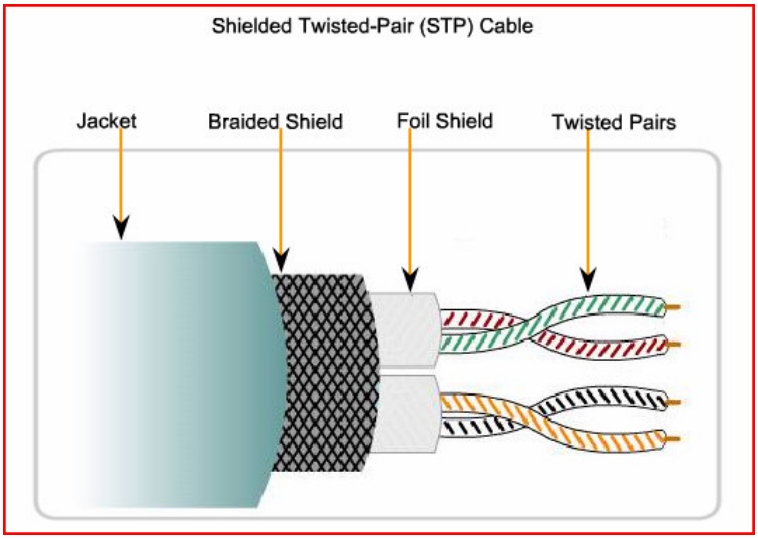
- Antennenanschlüsse (Wireless)
- Radio/TV (Einweg Kommunikation)
- Früher für Ethernet, Heute UTP

STP

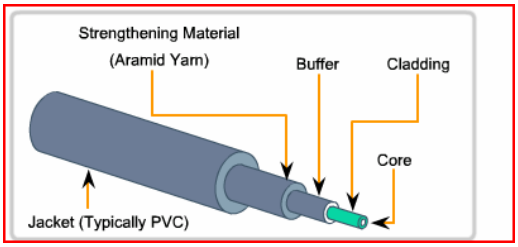
Shielded Twisted-Pair

Einsatz:

- Bis 10GB Ethernet



Fibre

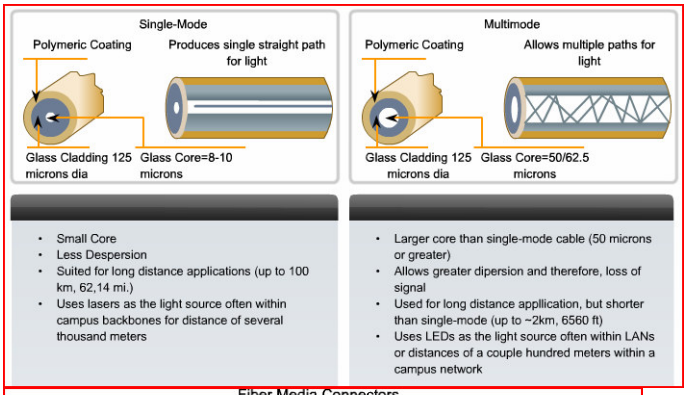


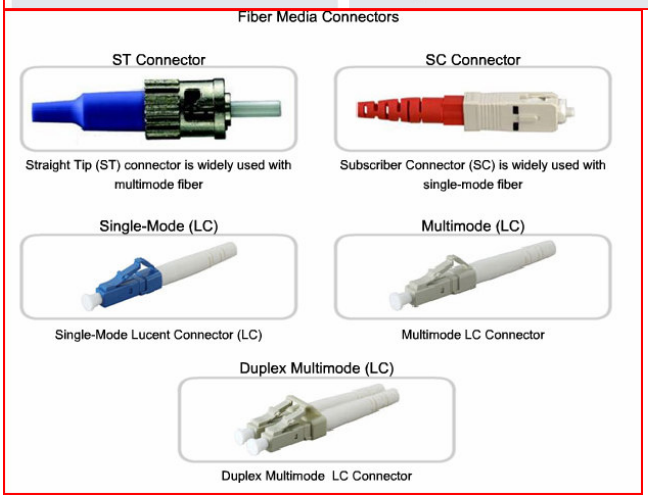
Vorteile

- **Längere** Distanzen (ohne Signalregeneration)
- **Nicht** anfällig auf **Magnetismus**
- **Wenig Signalverluste**

Weitere Fakten:

- **More expensive** (usually) than copper media over the same distance (but for a higher capacity)
- **Different skills and equipment** required to terminate and splice the cable infrastructure
- More **careful handling** than copper media





Fehlerquellen:

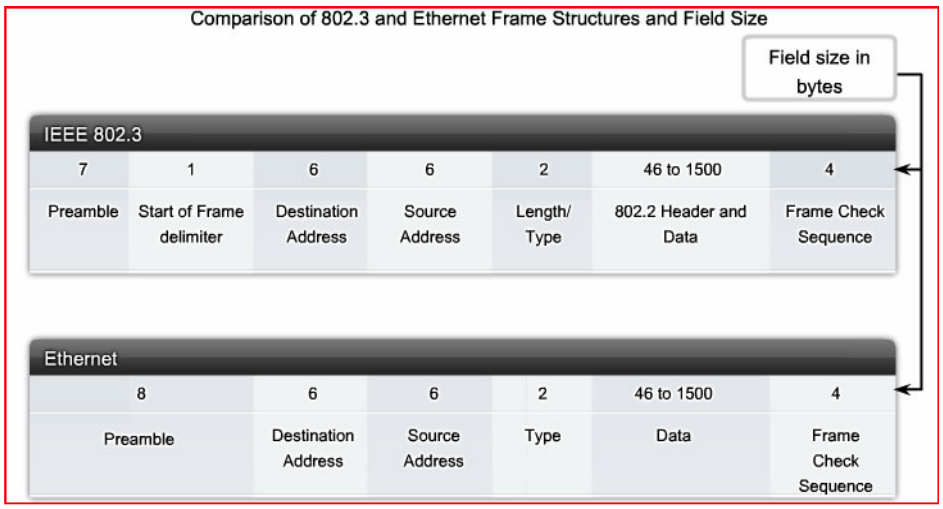
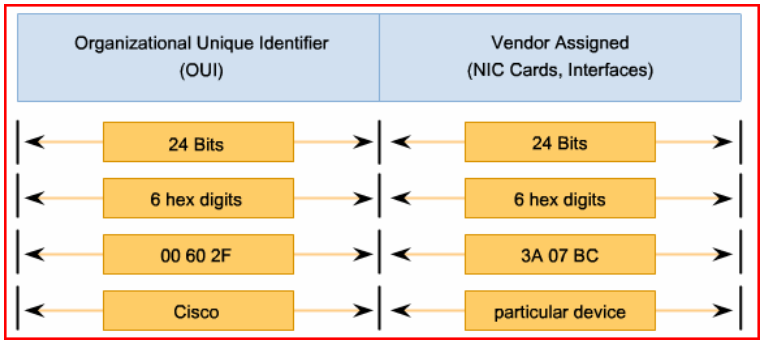
- **Misalignment** - the fiber-optic media are **not precisely aligned** to one another when joined.
- **End gap** - the media do **not completely touch** at the splice or connection.
- **End finish** - the media **ends are not well polished** or dirt is present at the termination.

Wireless	WiFi (WLAN) 802.11 Bluetooth 802.15 WiMAX 802.16

7 Chapter 9 (Ethernet)

Begriff	Beschreibung
Notwendige Layer 1 Elemente	• The physical media and associated connectors • A representation of bits on the media • Encoding of data and control information • Transmitter and receiver circuitry on the network devices

LLC/MAC	• 802.2 beschreibt LLC
	  ○ Stellt Kommunikation zwischen Layer 2 und höheren Layern sicher
	• 802.3 beschreibt MAC
	  ○ In Hardware (NIC) implementiert
	  ○ Hauptfunktionen :
	  ▪ Data Encapsulation (Hauptfunktionen)
	  • Frame delimiting
	  • Addressing
	  • Error detection
	  ▪ Media Access Controll

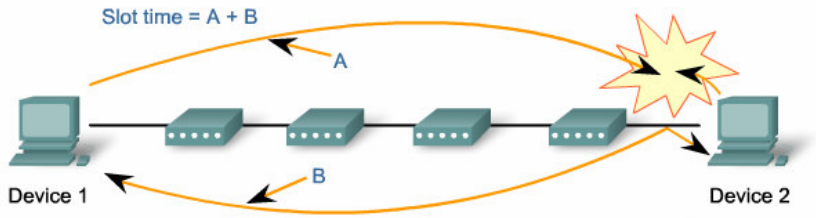
Frame Grösse	• 64 – 1518 bytes ○ Alles enthalten **ausser Preamble und Start-of-Frame-Delemiter**
Frame-Aufbau	
Aufbau MAC-Adresse	 BIA – Burned in Adress (im ROM gespeichert, nicht änderbar)
Broadcast	Bei Multicast wird Destination-MAC auf FF-FF-FF-FF-FF-FF gesetzt (alle 1)
Multicast	Layer 3 – IP-Multicast-Adressraum (224.0.0.0 to 239.255.255.255) Layer 2 – MAC startet mit 01-00-5E….

CSMA

- Erkennt die elektrische Aktivität im Kabel
- JAM-Signal nach Kollision ist 32 Bit lang
  - Meistens nur eine Folge von 010101
  - Wird als solches durch seine Länge erkannt
  - Alle Stationen müssen warten (Random Time durch back-off-timer)
  - Kollisionsverursachende Station muss länger warten.

Bit- und Slot Time

Ethernet Slot and Bit Times



Speed	Slot Time	Time Interval
10 Mbps	512 bit time	51.2 µs
100 Mbps	512 bit time	5.12 µs
1 Gbps	4096 bit time	4.096 µs
10 Gbps	not applicable	not applicable

Ethernet Speed	Bit time
10 Mbps	100 ns
100 Mbps	10 ns
1000 Mbps = 1 Gbps	1 ns
10,000 Mbps = 10 Gbps	.1 ns

Interframe Spacing

- Zeitabstand zwischen zwei Paketen
- 96 Bits (Zeit je nach Geschwindigkeit verschieden). Bei 10Mbit Ethernet folglich 9.6 ns

Types of Ethernet

Ethernet Type	Bandwidth	Cable Type	Duplex	Maximum Distance
10Base-5	10 Mbps	Thicknet Coaxial	Half	500 m
10Base-2	10 Mbps	Thinnet Coaxial	Half	185 m
100Base-TX	10 Mbps	Cat3/Cat5 UTP	Half	100 m
100Base-TX	100 Mbps	Cat5 UTP	Half	100 m
100Base-FX	200 Mbps	Cat5 UTP	Full	100 m
100Base-FX	100 Mbps	Multimode Fiber	Half	400 m
1000Base-T	200 Mbps	Multimode Fiber	Full	2 km
1000Base-TX	1 Gbps	Cat5e UTP	Full	100 m
1000Base-SX	1 Gbps	Cat6 UTP	Full	100 m
1000Base-LX	1 Gbps	Multimode Fiber	Full	550 m
10GBase-CX4	1 Gbps	Single-Mode Fiber	Full	2 km
10GBase-T	10 Gbps	Twin-axial	Full	100 m
10GBase-LX4	10 Gbps	Cat6a/Cat7 UTP	Full	100 m
10GBase-LX4	10 Gbps	Multimode Fiber	Full	300 m
10 Mbps	10 Gbps	Single-Mode Fiber	Full	10 km

Hub vs. Switch

Vorteile:

- Dedicated bandwidth to each port
- Collision-free environment
- Full-duplex operation

Basis-operationen Switch	• Learning (Switching-Table wird geführt) • Aging (Einträge werden nach einer gewisse Zeit gelöscht, z.B: WLAN) • Flooding (Falls Eintrag nicht in Table, dann wird an alle Ports, ausser dem Sender, das Frame geschickt) • Selective Forwarding • Filtering (kaputе Frames)
ARP Protokoll	Basisfunktionen • Löst IPv4 Adressen in MAC-Adressen auf • Unterhält einen Speicher zum Verbinden von MAC- und IP-Adresse (gespeichert im RAM) • Zwei Arten der Pflege o Ankommende Pakete werden analisiert und Daten werden eingetragen o Senden eines ARP-Requests (Broadcast) o Sind mit Zeitstempel versehen Falls Frame ausserhalb des Netzwerkes gesendet werden muss, ist Gateway in der ARP-Tabelle.

8 Chapter 10 – Planning and Cabling Networks

Begriff	Beschreibung
Wichtigste Faktoren bei Planung eines LANs	• Cost • Speed and Types of Ports/Interfaces • Expandability • Manageability • Additional Features and Services
Anschaffung Switches	Kriterien: • Just enough ports for today's needs? • A mixture of UTP speeds? • Both UTP and fiber ports?
Anschaffung Router	Gleiche Faktoren wie bei Switches, zusätzlich: • Expandability • Media • Operating System Features
Operating System Features	• Security • Quality of Service (QoS) • Voice over IP (VoIP) • Routing multiple Layer 3 protocols • Special services such as Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP)
Kriterien bei Kabel-installation	• Work area • Telecommunications room, also known as the distribution facility • Backbone cabling, also known as vertical cabling • Distribution cabling, also known as horizontal cabling
Serielle Verkabelung (WAN)	• DCE (Data Communication Equipment) → gibt Clock-Rate vor • DTE (Data Terminal Equipment)

Gründe für Aufteilen der Netzwerke	• Broadcast Domäne (und somit Overhead) werden eingegrenzt • Einfacheres Verwalten von Netzwerkdiensten (Drucker, etc) • Sicherheit
Konfiguration Serial-Port für Terminal Session	• Bits per second: 9600 bps • Data bits: 8 • Parity: None • Stop bits: 1 • Flow control: None
Zu Berücksichtigen bei Medienwahl	• Kabellänge • Kosten (Budget) • Bandbreite • Einfachheit der Installation (Kabelverlebung in Wänden, Radien) • EMI/RFI (Störungen)

9 Chapter 11 – Testing and Configuring Network

Begriff	Beschreibung
Funktionen von IOS	• Basic routing and switching functions • Reliable and secure access to networked resources • Network scalability
Übliche Zugriffsarten über	• Console • Telnet or SSH • AUX port

Hierarchische Gliederung von IOS	• **User** executive mode
	  ○ **Privileged** executive mode
	  ▪ **Global** configuration mode
	  • Other **specific** configuration modes

Beispiele	When describing the use of commands, we generally use these conventions. Convention / Description Boldface text indicates commands and keywords that are entered literally as shown. *italics* — Italic text indicates arguments where the user supplies values. [X] — Square brackets enclose an optional element (keyword or argument). | — A vertical line indicates a choice within an optional or required set of keywords or arguments. [X | Y] — Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice. {X | Y} — Braces enclosing keywords or arguments separated by a vertical line indicate a required choice.