

3 Protocols and Models

3.1 The Rules

- Communication: Message source (sender) → Channel → Message Destination (receiver)
- Protocols: Rules
 - An identified sender and receiver
 - Common language and grammar
 - Speed and timing of delivery
 - Confirmation or acknowledgment requirements
- Network Protocol Requirements
 - Message encoding / decoding: convert information into form for transmission
 - Message formatting and encapsulation: Address, envelope
 - Message size
 - Message timing
 - * Flow control: managing rate of data transmission
 - * Response timeout
 - * Access method: Avoid collisions
 - Message delivery options
 - * Unicast
 - * Multicast
 - * Broadcast

3.2 Protocols

- Protocol Types
 - Network Communications Protocols: IP, TCP, HTTP
 - Network Security Protocols: SSH, SSL, TLS
 - Routing Protocols: OSPF, BGP
 - Service Discovery Protocols: DHCP, DNS
- Protocol functions
 - Addressing: Ethernet, IPv4, IPv6
 - Reliability: TCP
 - Flow Control: TCP
 - Sequencing: TCP
 - Error Detection: Ethernet, IPv4, IPv6, TCP
 - Application Interface: HTTP, HTTPS
- Protocol Interaction
 - HTTP – TCP – IP – Ethernet

3.3 Network Protocol Suites

- Evolution
 - Internet Protocol Suite or TCP/IP
 - ISO (OSI) 1977
 - AppleTalk 1985 - 1995
 - Novell Netware 1983 - 1995
- TCP/IP Protocol Suite
 - Open standard (free)
 - Standards based
 - Grafik !!!
- TCP/IP Communication Process
 - Encapsulation: Animation anschauen!

3.4 Standards Organizations

- Internet Standards organizations
 - ISOC (Internet Society)
 - IAB (Internet Architecture Board)
 - IETF (Internet Engineering Task Force): RFC documents (Request for Comments)
 - IRTF (Internet Research Task Force)
 - ICANN (Internet Corporation for Assigned Names and Numbers): IP-Adressen, Domain names
 - IANA (Internet Assigned Numbers Authority): Protocol numbers
- Electronic and Communication Standards
 - IEEE (Institute of Electrical and Electronics Engineers): 802.3 Ethernet, 802.11 WLAN
 - EIA (Electronic Industries Alliance): Kabel, Buchsen, 19-inch Racks
 - TIA (Telecommunications Industry Association):
 - ITU-T (International Telecommunications Union-Telecommunication Standardization Sector): DSL

3.5 Reference Models

- kohnlehome.de/netz/OSIModell.pdf
- Sniffen in Packet-Tracer und Wireshark

3.6 Data Encapsulation

- Segmentation
- Multiplexing
- Sequencing
- Protocol Data Units

3.7 Data Access

- Addresses
 - Transport Layer: Source + Destination addressport numbers
 - Network Layer : Source + Destination addresses
 - Data link layer: Source + Destination addresses
- Layer 3: Logical Adresse
 - IPv4: Network + Host
 - IPv6: Prefix + Interface ID