

L00 - Course Agenda - Infos (Preliminary!!!)

Datenkommunikation

384.081 - SS 2007

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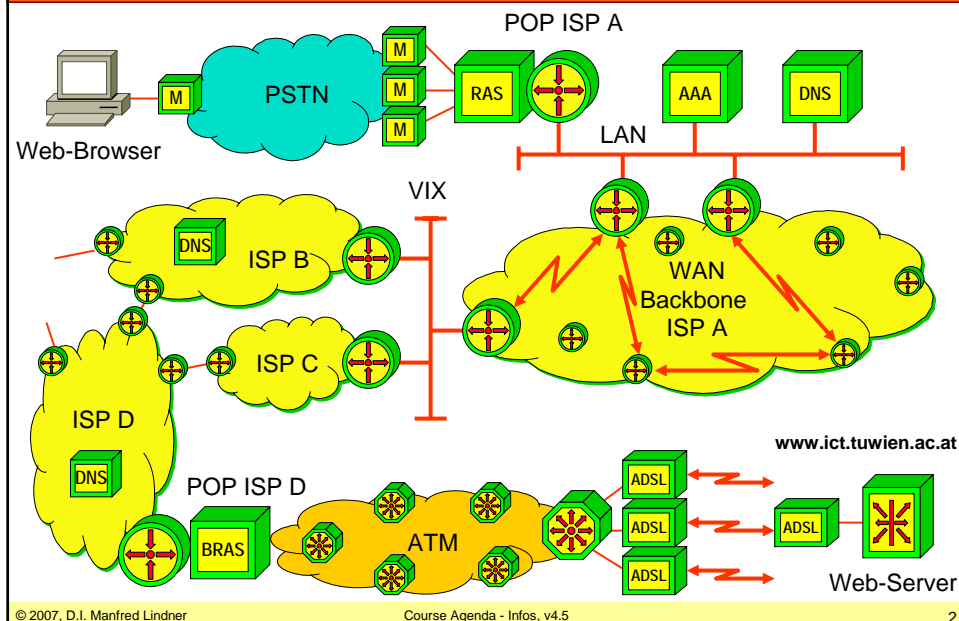
Home Page:

<http://www.ict.tuwien.ac.at/skripten/datenkomm/index.html>

Institut für Computertechnik

TU-Wien

Today's Internet Scenario



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Some of the Terms Used		Confused?	
Modem	Serial	IP Address	Connection-oriented
RS232	PSTN	AAA	Ethernet
Layer	Synchronous-TDM	Protocol	Sequence-Number
POP	Router	URL	Packet Switching
Virtual Circuit	POTS	Interface	LAN
TCP	PPP	UDP	Cell Switching
CSMA/CD	WAN	IP Datagram	ATM
Connectionless	CHAP	Authentication	Error Recovery
HTTP	IPCP	OSI	DNS
HTML	RIP	Routing Protocol	ADSL
	OSPF	Peering Point	Circuit Switching
	WWW	VIX	Bit
	BGP	Service	Asynchronous-TDM

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Task of this Lecture

- **Solve the confusion**
 - Show you one way through the “jungle” of data communication terminology
- **How is the way constructed?**
 - First learn about and understand fundamental principles
 - Find and study these principles in real data communication technologies
- **Provide the fundament**
 - For understanding current data communications technologies
 - For going deeper in that area by advanced lectures

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Lecture Modules SS2007	1
Data Communication Fundamentals 1	
<div style="border: 1px solid black; background-color: #ffff00; padding: 5px; margin-bottom: 10px; text-align: center;">Transmission Principles</div> <div style="border: 1px solid black; background-color: #ffff00; padding: 5px; text-align: center;">Protocol Principles</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Serial <-> Parallel Transmission, Bit-Synchronization Asynchronous <-> Synchronous Transmission, Encoding Framing, Frame-Synchronization, Data Transparency, Bit-stuffing, Byte-stuffing Error Checking and Detection, Checksum Physical Aspects, Fourier, Shannon, Nyquist, AM, FM </div> <div style="border: 1px solid black; padding: 5px;"> 3 Layer Model: Com-HW, Com-SW, Appl.-SW Service Types: Connectionless - Connection-oriented Error Recovery by ARQ: Idle RQ, Continuous RQ with Selective ACK, Go-BackN, Positive ACK Sequence Numbers, Windowing, Timers, Pipe Capacity Flow Control, HDLC Overview </div>
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Lecture Modules SS2007	2
Data Communication Fundamentals 2	
<div style="border: 1px solid black; background-color: #ffff00; padding: 5px; margin-bottom: 10px; text-align: center;">Time Division Multiplexing</div> <div style="border: 1px solid black; background-color: #ffff00; padding: 5px; margin-bottom: 10px; text-align: center;">Network Principles Circuit Switching</div> <div style="border: 1px solid black; background-color: #ffff00; padding: 5px; text-align: center;">Network Principles Packet Switching OSI Model Overview WAN</div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Synchronous TDM Statistical (Asynchronous) TDM Digital Voice Transmission, PCM PDH SDH </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Circuit Switching (CS) ISDN Overview </div> <div style="border: 1px solid black; padding: 5px;"> Packet Switching Connectionless (PS CL) e.g. IP, L2 Switching (Ethernet Switching) Packet Switching Connection-Oriented (PS CO) Overview WAN Technologies X.25, Frame Relay, ATM OSI - 7 Layer Model of ISO </div>
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Lecture Modules SS2007		3
Local Area Network (LAN) Technology		
LAN Principles Legacy Ethernet	LAN Characteristics: Shared Media, Broadcast, Addressing IEEE 802: Media Access Control (MAC), Logical Link Control (LLC), DSAP, SSAP CSMA/CD, Slot Time, Framing, Ethernet v2, SNAP PLS, AUI, Transceiver, Repeater, Hub 10Base5, 10Base2, 10BaseT, FOIRL, 10BaseF	
Packet Switching on LANs: Transparent Bridging and Spanning Tree Protocol	Bridging Methods Transparent Bridging: Forwarding, Flooding, Filtering, Aging, Learning, Broadcast Storm Spanning Tree (STP): Algorithm and Procedures Rapid Spanning Tree (RSTP) Bridging versus Routing (Pro's and Con's)	
Ethernet Evolution L2 Switching and VLANs High Speed Ethernet	Ethernet Evolution, Collision Domain, Broadcast Domain Ethernet Switching (L2 Switching = Fast Transparent Bridging) VLAN (Virtual LAN) Technique, Tagging, Trunking, Full Duplex, new Coding, Autonegotiation, Flow Control, Fast Ethernet (100BaseX), Gigabit Ethernet (1000BaseX) and 10 Gigabit Ethernet	
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Lecture Modules SS2007		4
IP Technology 1		
IP Technology	Principles: CL Packet Switching IP Host, IP Router, IP (CL) <-> TCP (CO) Story of Success, RFCs IP Protocol Details: TTL, Fragmenting, TOS, ... IP Addressing, Address Classes, Subnetting, IP Forwarding IP Forwarding and ARP IP Forwarding and ICMP ICMP Details Ping and Traceroute ARP PPP	
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Lecture Modules SS2007		5
IP Technology 2		
IP Routing Overview	Static Routing Default Route Dynamic Routing: Distance Vector Technique versus Link State Technique Routing Information Protocol RIP: Basics, Count-to-Infinity Problem, maximum Hop Count, Split Horizon, Poisoned Reverse, Triggered Update, Hold Down RIP version Classful versus Classless Routing private Addresses and NAT Introduction to Internet Routing: Autonomous Systems, Interior versus Exterior Gateway Protocols, Introduction to BGP, CIDR	
OSPF Routing	Open Shortest Path First Introduction of Link State Concept (Topology database, LSA, The Dijkstra Algorithm, ...) Communication Procedures, LSA Broadcast Handling, Broadcast Networks, Summary of Benefits	
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Lecture Modules SS2007		6
Internet Transport Layer		
TCP Fundamentals UDP TCP Performance	Transmission Control Protocol: Concept of Ports and Sockets, TCP Connection Three Way Handshake, Handling of Sequence Numbers and Timers, Sliding Window and Flow Control User Datagram Protocol TCP Performance: Slow Start and Congestion Avoidance Fast Retransmit and Fast Recovery	
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Applications for TCP/IP Administration	
<div style="border: 1px solid black; background-color: #ffff00; text-align: center; padding: 10px; margin-bottom: 5px;"> BootP DHCP TFTP </div> <div style="border: 1px solid black; background-color: #ffff00; text-align: center; padding: 10px;"> DNS </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Boot Strap Protocol Mapping of static IP address (MAC based) IP address of TFTP Server Filename for booting Vendor specific area: SBM, Def-GW, ... -> DHCP BootP Relay Agent Dynamic Host Configuration Protocol Leasing of dynamic IP address Mapping of static IP address (MAC based) Complete configuring of TCP/IP Protocol stack Trivial File Transfer Protocol UDP based IdleRQ Protocol </div> <div style="border: 1px solid black; padding: 5px;"> Domain Name System Mapping Symbolic Names to IP addresses Tree-like Topology, FQDN DNS Server (primary, secondary), Resource Records Zone-Files, Root Hints, iterative/ recursive Lookup DNS Protocol </div>
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Lecture Modules SS2007	8
TCP/IP Standard Applications 1	
<div style="border: 1px solid black; background-color: #ffff00; text-align: center; padding: 10px; margin-bottom: 5px;"> Telnet </div> <div style="border: 1px solid black; background-color: #ffff00; text-align: center; padding: 10px; margin-bottom: 5px;"> FTP </div> <div style="border: 1px solid black; background-color: #ffff00; text-align: center; padding: 10px;"> SMTP - Email </div>	<div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Virtual Terminal Remote Login Half duplex Device with printer facilities NVT Commands, Options </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> File Transfer Protocol File OS contra File Transfer, translation contra pragmatic Control port, data transfer port Protocol Interpreter, Data Transfer Process Active versus passive FTP </div> <div style="border: 1px solid black; padding: 5px;"> Simple Mail Transfer Protocol E-Mail Basics, E-Mail address MUA contra MTA SMTP in detail POP, IMAP MIME </div>
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Lecture Modules SS2007		9
TCP/IP Standard Applications 2		
HTTP - WWW	Hypertext Transfer Protocol History and Idea of Hypertext and WWW URL, Browser, GUI, HTML WEB Browser static, dynamic WEB Server static, dynamic HTTP	
Advanced IP Switching / IP Routing Technology		
MPLS (Multiprotocol Label Switching)	Introduction Problems with traditional IP over WAN MPLS Principles Label Distribution Modes MPLS Details (Cisco) Traffic Engineering	
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Appendix Modules SS2007		10
Wide Area Network (WAN) Technology 1 – Background Information & Details		
HDLC	Most Important Real Line-Protocol Modem Half Duplex, Full Duplex and Multipoint Control Station Types, Operation Modes Frame Format, Frame Types Protocol Procedures	
ISDN	Base of Circuit Switching WANs for Voice and Data Transmission (Integrated Services Digital Network) Principles and Terminology, TE, TA, NT Physical Layer: BRI, PRI Data Link Layer: LAPD (Q.921) Network Layer: Q.931	
X.25	Grandfather / Grandmother of Packet Switching WANs Overview, Principles, Standards X.25 Data Link Layer: LAPB X.25 Packet Layer: Services and Packet Types Protocol Procedures: Call Setup and Release, Data Transfer and Flow Control, Reset and Restart	
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Appendix Modules SS2007		11
Wide Area Network (WAN) Technology 2 - Background Information & Details		
Frame Relay	Overview Principles, Standards Frame Relay User Plane LAPF Traffic Management	
ATM Technology ATM QoS ATM Routing	Asynchronous Transfer Mode Principles ATM Layers Quality of Service (QoS) PNNI Routing	
Advanced IP Routing - Background Information & Details		
OSPF Areas	Backbone Area, Area Border Router, Intra- and Inter-Area Routes Autonomous System Boundary Router, Stub Areas, Virtual Link, Route Summarization Header Details	
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Recommended Literature
<ul style="list-style-type: none"> ● Data Communications, Computer Networks and Open Systems <ul style="list-style-type: none"> – Fred Halsall, Addison Wesley, 4th Edition 1996, ISBN 020142293X ● Computer Networking and the Internet <ul style="list-style-type: none"> – Fred Halsall, Addison Wesley, 5th Edition, 2005 ISBN 321263588 ● Computer Networks <ul style="list-style-type: none"> – Andrew S. Tanenbaum, Prentice Hall, 4th Edition, 2003 ISBN 0130384887
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Additional Information Sources

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- **Homepage of this course provides links for background information and details**

<http://www.ict.tuwien.ac.at/skripten/datenkomm/index.html>

- Collection of all Lectures of Manfred Lindner
 - all modules about data communication with actual version number
- TCP/IP - Tutorial:
 - <http://www.redbooks.ibm.com/pubs/pdfs/redbooks/gg243376.pdf>
- Internet Protocol Journal:
 - <http://www.cisco.com/ipj>
 - see "IPJ Content Overview" on homepage of lecture
- Personal "Best of" Literature List
- HTML / WWW Tutorial:
 - <http://www.selfhtml.org/>
- Cisco IOS documentation

Additional Information Sources

2

- IETF RFC´s:
 - Internet standards
 - <http://ftp.univie.ac.at/netinfo/>
 - <http://www.rfc-editor.org/index.html>
- IEEE Free Download:
 - LAN standards
 - <http://standards.ieee.org/getieee802>
- MPLS / Frame Relay / ATM Forum:
 - FR, ATM and MPLS standards and white papers
 - <http://www.mfaforum.com>
- Wikipedia
 - <http://de.wikipedia.org/wiki/Hauptseite>
 - http://en.wikipedia.org/wiki/Main_Page

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Learning by Understanding

- **Free Ethernet Protocol Analyzer:**
 - <http://www.ethereal.com>
 - <http://www.wireshark.org>
 - Download it and install it on your PC
- **Start analyzing your Internet activities!!!**

Symbols used in the Lectures

