

Introduction to Data Communications

Concepts and Mechanisms

Client-Server Model	Request/Response
Web Access	Domains and URLs
Naming Service	Email
	Network Management
Ports and multiplexing	Flow Control
Connection Management	Congestion Control
ACKs and Retransmissions	Sequence Numbers
	End-to-End
Routing	Forwarding
Routing Tables	Bellman-Ford
	Dijkstra
	Congestion Control
Addressing	Packet Switching
	Circuit Switching
Flow Control	Automatic Repeat Request
Sliding Window	Hardware Addresses
Checksum	Go-Back-N
Selective-Reject	Multiplexing
	Stop-and-Wait
	Parity
	Hamming
	Throughput
	Forward Error Correction
Analog Signals	Analog Data
Duplex/Simplex	Digital Data
Shannon Capacity	Digital Signals
	Encoding Schemes
	Nyquist Capacity
	Free-space Loss
Bandwidth	Frequency
	Spectrum

Protocols and Technologies

	Many other application protocols			
Application	HTTP	SMTP	POP3	IMAP4
				SNMP
				DNS
Transport	TCP		UDP	
Network	IP		ICMP	
			ARP	
Data Link	Other DLL	Telephone Network	Frame Relay	PDH and SDH
				X.25
				ATM
				IEEE 802 (Ethernet, Wireless LAN, ...)
				PHY
Physical	NRZ	NRZI	ASK	FSK
				PSK
				PCM
	Other Physical			
	Copper	Optical Fibre	Coaxial	Wireless

Security

Application	HTTPS	SSH	SFTP	⋮
Transport	TLS/SSL			
Network	IPsec			
Data Link	Data Link and Physical specific protocols			
Physical	Data Link and Physical specific protocols			
	Access Control	Availability	Authentication	Data Integrity
	Confidentiality	Encryption	Digital Signature	Confidentiality
	RSA	Non-Repudiation	Symmetric Key	AES
	DES	Hash	Public Key	Digital Signature