Protocols

define format, order of messages sent and received among network entities, and actions taken on message transmission, receipt

network structure

access networks, physical media:wired, wireless commun-ication links	TDM = time division multip-lexing time divided into frames fixed duration fixed number time slots

network core: •interconnected routers•network of networks

FDM = frequency division multip-lexing: diff CHs transmitted in diff frequency bands

Equations

4 Sources of packet delays	dnodal = dproc + dqueue + dtrans +dprop
dproc : nodal processing, check bit errors, determine output link	dqueue: queueing delay, time waiting at output link for transmission, depends on congestion of router
dtrans: how long it takes to get on link	L (bits)/R(bps)
dprop: propag-ation delay	d (m)/s

Stacks

IP	application(http), transport(TCP), network(IP), link(W-iFi), physical(bits)
ISO/OSI	app, session(checkpo-inting), transport, network, link, physical

TCP / UDP

transmission control protocol	user datagram protocol
reliable transport, flow control, congestion control, DNP(timing, minimum throughput guarantee, security), connectio-n-oriented	unreliable data transfer, DNP
	1 IP & 1 port
	streaming, DNS (domain name system)