Internet Network Layer Model

CS 3171

	Layer	*Function*
5	Application	Performs end-user communication-based tasks Connects applications to applications
4	Transport	Provides logical communication between processes on different hosts [1, p. 167] Connects processes to processes (e.g. video & audio streams in an application)
3	Network Service	Transfers 'transport-layer segments from one host to another' [1, p. 271] Connects end-hosts to end-hosts
2	Data Link	Transfers datagrams across individual physical links [1, p. 379] Connects physical links (point-to-point)
1	Physical	Transfers sequences of bits without awareness of meaning Connects nodes using a physical medium

	Layer	*Value (added to layer below) & Protocols*
5	Application	Type of connection Many protocols, for example HTTP, SMTP, FTP, & Telnet
4	Transport	Flow control, congestion control, & error correction Protocol is one of TCP or UDP
3	Network Service	Routing Protocol is Internet Protocol (IP)
2	Data Link	Frame formatting & hardware addressing Many protocols, for example Ethernet & PPP
1	Physical	(none) Many protocols for cabling, connectors, signaling, etc.

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	Layer	*Protocol Data Unit*	*Typical Implementation and Components*
5	Application	Message	(Application software in host, at network edge, e.g. gateway*)
4	Transport	Segment†	(System software in host, at network edge)
3	Network Service	Datagram†	Router (Hardware & Software, in network core)
2	Data Link	Frame	Switch or Bridge‡ (Hardware & Software, in network core)
1	Physical	1-PDU	Network interface card, cable, wire, repeater, modem (Hardware)

* *Gateway*s convert application data with one protocol to a different but equivalent protocol. They can span the top three layers.

† The 'Internet literature (for example, the RFCs)' refer to 4-PDUs for TCP as *segment*s but often refer to the PDU for UDP as *datagram*s. [1, p. 171] It may help to think of a datagram as an independent informational message. If a datagram is lost, something must take care of it. A segment, however is part of a larger unit and so cannot be lost.

‡ A *bridge* (aka a *hub*) is responsible only for signal regeneration, but a *switch* segments traffic and reduces broadcast domain. When a switch is saturated with traffic it acts as a bridge and begins to *flood*.

Reference

[1] James F. Kurose and Keith W. Ross. *Computer Networking: A Top-Down Approach Featuring the Internet*. Addison-Wesley Longman, Inc., 2001. ISBN 0-201-47711-4.