

# 1. Networking Models

**Networking Model**—Comprehensive set of documents defining how the networking works, like a blueprint.

**Protocol**—Logical rules that devices follow to communicate.

**OSI (Open Systems Interconnect)**—International standardization drive by the ISO (International Organization for Standardization). Implementation fell into disuse, but the model remains.

**TCP/IP**—Grew out of a DoD (US Department of Defense) project with academic participation. Less formal process allowed quicker adoption.

**RFC (Request For Comments)**—Protocol definition documents in TCP/IP

**PDU (Protocol Data Unit)**—A generic term for a data message in any given layer of the models. More specific terms, like segment, packet, and frame can be used when talking about a certain layer in the TCP/IP model. OSI uses the term “PDU” for all layers.

**The Models**—Memorize the layer names and numbers (OSI mnemonic bottom to top: “Please Do Not Throw Sausage Pizza Away”). In RFC 1122, TCP/IP originally combined the data link and physical layers, calling them the link layer—often called the network access layer. Likewise, the network layer was originally called the internet layer. In the table, names are borrowed from the OSI model and preferred by Cisco.

TCP / IP	OSI	DESCRIPTION (OSI)	PDU	TECHNOLOGIES
Application	7—Application	Defines services used by applications	Segment	Telnet, HTTP, FTP, SMTP, POP3, SNMP (Implemented on hosts)
	6—Presentation	Format conversions (EBCDIC / ASCII) and encryption		
	5—Session	Start, End, and control conversations (sessions). Can notify application if only some expected messages have completed. (Where transport (TCP) would deal with the other end of the conversation to cope with missing segments)		
Transport	4—Transport	Delivery between endpoints, possible error-recovery (TCP resends)	Segment	TCP, UDP (on hosts)
Network	3—Network	Logical addressing, routing	Packet	IP (routers)
Data Link	2—Data Link	Physical addressing and interfacing to a particular method of physical transport)	Frame	Ethernet, PPP, T1 (switches)
Physical	1—Physical	Connector pinouts, voltages		Hubs, repeaters

## T H E O S I M O D E L

The layer numbers from the OSI model are still used to describe other models, for example a "layer-2 switch."

### Benefits of Layering

- **Simplicity**—breaks complexity into smaller pieces, easier to learn
- **Standard Interfaces**—vendor-neutral interoperability

## T H E T C P M O D E L

TCP (Transmission Control Protocol)—Acknowledging received segments allows for error recovery by resending

Adjacent-Layer interactions—Within one computer, higher level protocols delegate the actual work to lower-level ones.

Same-Layer interactions—protocols of the same layer on opposite ends of the connection are communicating with each other.

Network Layer—Uses IP (Internet Protocol) to provide addressing and routing

Dotted Decimal Notation (DDN)—e.g. 10.0.0.1. Four decimal numbers, each 0-255, separated by decimals, representing a 32-bit binary number.

Host—An end device on the network, like a computer, printer, or IP telephone.

Router—An intermediate device that forwards packets toward their destination, based on their IP address.

Encapsulation—Lower levels prepend their own data in a header for use by the same layer at the other end of the transmission. The data link layer also appends a checksum to the end.

LAN (Local-Area Network)—Combination of user devices, switches, and cabling

WAN (Wide-Area Network)—Author just mentions longer distance. I use the distinction that a WAN hands off the data to a service provider / telco for delivery to, e.g. a branch office.