OSI Reference Model

- Short for **Open System Interconnection**, an ISO standard for worldwide communications that defines a networking framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, proceeding to the bottom layer, over the channel to the next station and back up the hierarchy.
- At one time, most vendors agreed to support OSI in one form or another, but OSI was too loosely defined and proprietary standards were too entrenched. Except for the OSI-compliant X.400 and X.500 e-mail and directory standards, which are widely used, what was once thought to become the universal communications standard now serves as the teaching model for all other protocols. See: ***http://webopedia.com/TERM/O/OSI.html***
- Most of the functionality in the OSI model exists in all communications systems, although two or three OSI layers may be incorporated into one.
- Tip for remembering the names of the OSI Model layers: **A**ll **P**eople **S**eem **T**o **N**eed **D**ata **P**rocessing

Layer	Name	Function	
7	Application Layer	Program-to-program communication. • Provides interface to end-user processes • Provides standardized network services to the user's applications	User Support Layers
6	Presentation Layer	Manages data representation conversions. For example, the Presentation Layer would be responsible for converting from EBCDIC to ASCII. • Specifies architecture-independent data transfer format • Encodes and decodes data; encrypts and decrypts data; compresses data	
5	Session Layer	Responsible for establishing and maintaining communications channels. In practice, this layer is often combined with the Transport Layer. Handles traffic flow. (NetBIOS)	
4	Transport Layer	Responsible for end-to-end integrity of data transmission. (TCP, UDP, SPX) (L4 PDU=segment) • Manages network layer connections • Provides reliable packet delivery mechanism	
3	Network Layer	Responsible for the source-to-destination delivery of a packet across multiple network links. • Addresses and routes **packets** (a.k.a. datagrams) • Devices: Routers, and Layer 3 switches • Protocols: IP (IPv4, IPv6), ICMP, IPsec, IGMP, IPX, AppleTalk • **Logical** addressing	Network Support Layers
2	Data Link Layer	Responsible for physically passing data from one node to another. • **Frames** packets • Controls physical layer data flow • Devices: **Switches**, Bridges, **Network Interface Cards (NIC's)** • Protocols: ARP • **Physical** addressing	
1	Physical Layer	Manages putting data onto the network media and taking the data off. • Interfaces between network medium and network devices. • Defines electrical and mechanical characteristics. • Devices: **Hubs**, repeaters, NIC's • Deals with "bits."	

TCP/IP model and protocols compared to the OSI Reference Model

Internet Model	**OSI Model**	TCP/IP Protocol Suite	
Application	Application	Application	Telnet, FTP, TFTP, NTP, PING, BOOTP, DHCP, HTTP
	Presentation		
	Session		
Transport	Transport	Transport	TCP, UDP, SCTP
Network	Network	Internet	IP, CMP
Data link	Data link	Network Interface	Ethernet, Token Ring, ARP
Physical	Physical		

DoD Four Layer Model

Layer	Name	Description	Corresponding OSI Model Layers
4	Application or Process Layer	Contains protocols that implement user-level functions, such as mail delivery, file transfer and remote login.	Application, Presentation, Session
3	Host-to-Host Layer	Handles connection rendezvous, flow control, retransmission of lost data, and other generic data flow management. The mutually exclusive TCP and UDP protocols are this layer's most important members.	Transport
2	Internet Layer	Responsible for delivering data across a series of different physical networks that interconnect a source and destination machine. Routing protocols are most closely associated with this layer, as is the IP Protocol, the Internet's fundamental protocol.	Network
1	Network Access Layer	Responsible for delivering data over the particular hardware media in use. Different protocols are selected from this layer, depending on the type of physical network.	Data Link, Physical

Reference: http://freesoft.org/CIE/Topics/16.htm

Standard, well-known, and often vulnerable Internet service ports

Port	Service	Protocol
20	FTP (File Transfer Protocol) - Data	TCP/UDP
21	FTP (File Transfer Protocol) - Control	TCP/UDP
22	SSH Remote Login Protocol	TCP/UDP
23	Telnet	TCP/UDP
25	SMTP (Simple Mail Transfer Protocol)	TCP/UDP
53	DNS (Domain Name System)	TCP/UDP
69	TFTP (Trivial File Transfer Protocol)	TCP/UDP
79	Finger	TCP/UDP
80	HTTP	TCP/UDP

Port	Service	Protocol
110	POP3	TCP/UDP
113	IDENT	TCP/UDP
119	NNTP (Newsgroup)	TCP/UDP
139	NetBIOS	TCP/UDP
143	IMAP	TCP/UDP
161	SNMP (Simple Network Management Protocol)	TCP/UDP
389	LDAP (Lightweight Directory Access Protocol)	TCP/UDP
443	HTTPS	TCP/UDP
3389	Remote Desktop Protocol (RDP)	TCP

IP Address Classes (IP v4)

Class	First Network ID	Last Network ID	First Usable Host ID	Last Usable Host ID	No. of Networks	Hosts per Network	High Order bits	Network Number bits	Host Number bits
A	1.0.0.0	126.0.0.0	w.0.0.1	w.255.255.254	126	16,777,214	0000	0-7	8-31
B	128.0.0.0	191.255.0.0	w.x.0.1	w.x.255.254	16,384	65,534	1000	1-15	16-31
C	192.0.0.0	223.255.255.0	w.x.y.1	w.x.y.254	2,097,152	254	1100	2-24	25-31

127.x.y.z is a reserved address used for the local loopback and self-diagnostic. IPv4 addresses are 32-bits (4-bytes) wide

Reserved IP Addresses

There are several groups of IP addresses which are considered to be "reserved" and are never actually used on the Internet. Under normal conditions, IP routers refuse to pass packets destined for these addresses. They are:

Class	First Network ID	Last Network ID
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

IPv6

The number of unassigned Internet addresses is running out, so a new classless scheme called CIDR is gradually replacing the system based on classes A, B, and C and is tied to the adoption of IPv6. An IP v6 address is 128-bits (16-bytes) wide.