

NETWORKING CHEATSHEET:

OSI:

- **Layer 1—Physical layer:** This is the physical and electrical medium for data transfer. It includes but is not limited to cables, jacks, patch panels, punch blocks, hubs, and MAUs. This layer is also known as the physical plant. Concepts related to the physical layer include topologies, analog versus digital/encoding, bit synchronization, baseband versus broadband, multiplexing, and serial (5-volt logic) data transfer. If you can touch a network element, it is part of the physical layer, which makes this layer one of the easiest to understand. The unit of measurement used on this layer is bits.
- **Layer 2—Data link layer (DLL):** This layer establishes, maintains, and decides how transfer is accomplished over the physical layer. Devices that exist on the DLL are network interface cards and bridges. This layer also ensures error-free transmission over the physical layer under LAN transmissions. It does so through physical addresses (the hexadecimal address that is burned into the ROM of the NIC), otherwise known as the MAC address (to be discussed more later in this lesson). Just about any device that makes a physical connection to a network and has the ability to move data is on the data link layer. The unit of measurement used on this layer is frames.
- **Layer 3—Network layer:** This layer is dedicated to routing and switching information to different networks, LANs, or internetworks. This can be on a LAN or WAN (wide area network). Devices that exist on the network layer are routers and IP switches. Here, we are getting into the logical addressing of hosts. Instead of physical addresses, the addressing system of the computer is stored in the operating system—for example, IP addresses. Now you can see that a typical computer will really have two addresses: a physical or hardware-based address such as a MAC address, and a logical or software-based address such as an IP address. Part of the trick in networking is to make sure the two addresses get along together. The unit of measurement used on this layer is packets.
- **Layer 4—Transport layer:** This layer ensures error-free transmission between hosts through logical addressing. Therefore, it manages the transmission of messages through layers 1 through 3. The protocols that are categorized by this layer break up messages, send them through the subnet, and ensure correct reassembly at the receiving end, making sure there are no duplicates or lost messages. This layer contains both connection-oriented and connectionless systems, which will be covered later in the book. Inbound and outbound ports are controlled by this layer. When you think “ports,” think the transport layer. The unit of measurement used on this layer is sometimes referred to as segments or messages. All layers above this one use the terms “data” and “messages.”
- **Layer 5—Session layer:** This layer governs the establishment, termination, and synchronization of sessions within the OS over the network and between hosts—for example, when you log on and log off. This is the layer that controls the name and address database for the OS or NOS. NetBIOS (Network Basic Input Output System) works on this layer.
- **Layer 6—Presentation layer:** This layer translates the data format from sender to receiver in the various OSES that may be used. Concepts include code conversion, data compression, and file encryption. Redirectors work on this layer, such as mapped network drives that enable a computer to access file shares on a remote computer.
- **Layer 7—Application layer:** This layer is where message creation—and, therefore packet creation—begins. DB access is on this level. End-user protocols such as FTP, SMTP, Telnet, and RAS work at this layer. For example, suppose you are using Outlook Express. You type a message and click Send. This initiates SMTP (Simple Mail Transfer Protocol) and other protocols, which send the mail message down through the other layers, breaking it into packets at the network layer and so on. This layer is not the application itself, but the protocols that are initiated by this layer.

Useful ports:

| PORT NUMBER | ASSOCIATED PROTOCOL | FULL NAME |
|--------------------|----------------------------|--|
| 21 | FTP | File Transfer Protocol |
| 22 | SSH | Secure Shell |
| 23 | Telnet | Terminal Network |
| 25 | SMTP | Simple Mail Transfer Protocol |
| 53 | DNS | Domain Name System |
| 80 | HTTP | Hypertext Transfer Protocol |
| 88 | Kerberos | Kerberos |
| 110 | POP3 | Post Office Protocol Version 3 |
| 119 | NNTP | Network News Transfer Protocol |
| 137–139 | NetBIOS | NetBIOS Name, Datagram, and Session Services, respectively |
| 143 | IMAP | Internet Access Message Protocol |

| PORT NUMBER | ASSOCIATED PROTOCOL | FULL NAME |
|--------------------|----------------------------|--|
| 161 | SNMP | Simple Network Management Protocol |
| 389 | LDAP | Lightweight Directory Access Protocol |
| 443 | HTTPS | Hypertext Transfer Protocol Secure (uses TLS or SSL) |
| 445 | SMB | Server Message Block |
| 1701 | L2TP | Layer 2 Tunneling Protocol |
| 1723 | PPTP | Point-to-Point Tunneling Protocol |
| 3389 | RDP | Remote Desktop Protocol (Microsoft Terminal Server) |

Cables:

| PIN # | 568B | 568A | BOGB |
|--------------|--------------|--------------|--------------|
| 1 | White/orange | White/green | White/blue |
| 2 | Orange | Green | Blue |
| 3 | White/green | White/orange | White/orange |
| 4 | Blue | Blue | Orange |
| 5 | White/blue | White/blue | White/green |
| 6 | Green | Orange | Green |
| 7 | White/brown | White/brown | White/brown |
| 8 | Brown | Brown | Brown |

| CABLE TYPE | SPEED |
|-------------------|-------------------------------|
| Category 3 | 10 Mbps |
| Category 5 | 100 Mbps |
| Category 5e | 100 Mbps and Gigabit networks |
| Category 6 | Gigabit networks |

| CABLING STANDARD | MEDIUM | MAXIMUM DISTANCE |
|-------------------------|---------------------------------------|--|
| 100BASE-FX | Multi-mode fiber Single-mode fiber | Half duplex: 400 meters; full duplex: 2 km Full duplex: 10 km |
| 100BASE-SX | Multi-mode fiber | 550 meters |
| 100BASE-BX | Single-mode fiber | 40 km |
| 100BASE-LX10 | Single-mode fiber | 10 km |
| 1000BASE-SX | Multi-mode fiber | 550 meters |
| 1000BASE-LX | Multi-mode fiber | 550 meters |
| 1000BASE-LX | Single-mode fiber | 5 km |
| 1000BASE-LX10 | Single-mode fiber | 10 km |
| 1000BASE-ZX | Single-mode fiber | Up to 70 km |

| CABLING STANDARD | MEDIUM | MAXIMUM DISTANCE |
|-------------------------|-------------------|-------------------------|
| 1000BASE-BX10 | Single-mode fiber | 10 km |
| 10GBASE-SR | Multi-mode fiber | 26–82 meters |
| 10GBASE-LR | Single-mode fiber | 10–25 km |
| 10GBASE-LRM | Multi-mode fiber | 220 meters |
| 10GBASE-ER | Single-mode fiber | 40 km |

Wi-fi:

| IEEE 802.11 STANDARD | DATA TRANSFER RATE (MAX.) | FREQUENCY |
|-----------------------------|----------------------------------|----------------------|
| 802.11a | 54 Mbps | 5 GHz |
| 802.11b | 11 Mbps | 2.4 GHz |
| 802.11g | 54 Mbps | 2.4 GHz |
| 802.11n | 600 Mbps (300 Mbps typical) | 5 GHz and/or 2.4 GHz |

| WIRELESS ENCRYPTION PROTOCOL | DESCRIPTION | ENCRYPTION LEVEL (KEY SIZE) |
|-------------------------------------|---------------------------------|------------------------------------|
| WEP | Wired Equivalent Privacy | 64-bit |
| WPA2 | Wi-Fi Protected Access | 256-bit |
| TKIP | Temporal Key Integrity Protocol | 128-bit |
| AES | Advanced Encryption Standard | 128-, 192-, and 256-bit |

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