

Connecting to the Internet

Dial-up Connection: Computers that are serving only as clients need not be connected to the internet permanently. Computers connected to the internet via a dial-up connection usually are assigned a dynamic IP address by their ISP (Internet Service Provider).

Leased Line Connection: Servers must always be connected to the internet. No dial-up connection via modem is used, but a leased line. Costs vary depending on bandwidth, distance and supplementary services.

Internet Protocol, IP

- The Internet Protocol is connection-less, datagram-oriented, packet-oriented. Packets in IP may be sent several times, lost, and reordered.

- ✓ No bandwidth
- ✓ No video or graphics
- ✓ No mobile connection
- ✓ No Static IP address
- ✓ Only 4 billion user support

IP Addresses and Ports

The IP protocol defines IP addresses. An IP address specifies a single computer. A computer can have several IP addresses, depending on its network connection (modem, network card, multiple network cards, ...). • An IP address is 32 bit long and usually written as 4 8 bit numbers separated by periods. (Example: 134.28.70.1).

- A port is an endpoint to a logical connection on a computer. Ports are used by applications to transfer information through the logical connection. Every computer has 65536 (2¹⁶) ports.
- Some well-known port numbers are associated with well-known services (such as FTP, HTTP) that use specific higher-level protocols.

Naming a web

- ✓ Every computer on the internet is identified by one or many IP addresses. Computers can be identified using their IP address, e.g., 134.28.70.1.
- ✓ Easier and more convenient are domain names.
- ✓ Computer names on the internet follow the Domain Name System (DNS) format.
- ✓ The Domain Name System (DNS) is a global naming service that translates names into IP addresses.

Advantages of DNS

- ✓ Ease of use (for humans): www.yahoo.com is more memorable than 216.32.74.52.
- ✓ When moving the web server (e.g., to a computer with better performance), only the DNS lookup entry needs to be changed.

- ✓ Domain names are structured hierarchically . Each domain name consists of domains that are separated by periods. Domain names are read from right to left.
- ✓ Example: www.mail.yahoo.

The TCP/IP Protocol Suite

The TCP/IP protocol suite, also referred to as the Internet protocol suite, is the set of communications protocols that implements the protocol stack on which the Internet and most commercial networks run. It is named after the two most important protocols in the suite: the Transmission Control Protocol (TCP) and the Internet Protocol (IP). The TCP/IP protocol suite—like the OSI reference model—is defined as a set of layers. Upper layers are logically closer to the user and deal with more abstract data, relying on lower layer protocols to translate data into forms that are transmitted physically over the network.

Application Layer

The application layer of the TCP/IP model corresponds to the application layer of the OSI reference model.

Transport Layer

The transport layer of the TCP/IP model maps fairly closely to the transport layer of the OSI model. Two commonly used transport layer entities are TCP and User Datagram Protocol (UDP).

Internet Layer

The Internet layer of the TCP/IP model maps to the network layer of the OSI model. Consequently, the Internet layer is sometimes referred to as the network layer. The primary component of the Internet layer is the Internet Protocol (IP). Many of the TCP/IP routing protocols are also classified as part of the Internet layer.

Network Access Layer

The lowest layer of the TCP/IP protocol stack is the network access layer. The network access layer contains two sublayers, the media access control (MAC) sublayer and the physical sublayer. The MAC sublayer aligns closely with the data link layer of the OSI model, and is sometimes referred to by that name. The physical sublayer aligns with the physical layer of the OSI model. Examples of the network access layer is Wireless Fidelity

Common Terms

Protocol Data Unit

In networking, protocol data unit (PDU) is a generic term for information that is delivered to the next lower level in the protocol stack.

Service Data Unit

The service data unit (SDU) is the data that a layer receives from the layer above. Generally speaking, the PDU for one layer becomes the SDU of the next lower layer.

Packet

In the generic sense, a packet is a formatted block of information carried by a computer network. A packet typically consists of three elements: a header, the payload, and a trailer.

Datagram

The terms datagram and packet are often used interchangeably. However, in the strictest sense, a datagram is a packet that is not transmitted reliably through the network. More specifically the datagram is the PDU used by UDP and IP.

Segment

A segment is the unit of data exchanged by TCP peers. It is encapsulated in a TCP packet and passed to the internet protocol (IP).

Frame

A frame is a data block of fixed or variable length which has been formatted and encoded for digital transmission over a node-to node link. Frames typically are used from the MAC sub layer downward. A frame can be thought of as the physical envelope that delivers an upper level packet or datagram.

User Datagram Protocol

The User Datagram Protocol is very simple. The PDU used by UDP is called a datagram. Datagrams are considered unreliable, in that there is no guarantee datagrams will be received in the correct order, if at all. If reliability of the information transmitted is needed, UDP should not be used. While UDP is unreliable, the lack of error checking and correction make UDP fast and efficient

for many less data intensive or time sensitive applications, such as the Domain Name Service (DNS), the Simple Network Management Protocol (SNMP), the Dynamic Host Configuration Protocol (DHCP) and the Routing Information Protocol (RIP). UDP is also well suited for streaming video.

Applications that use TCP

The following is a list of common applications that directly use the reliable data transfer services provided by TCP:

- **File Transfer Protocol (FTP)**—Provides a mechanism for moving data files between systems. The FTP client and server programs, as well as most Web browsers, contain an implementation of the FTP protocol.
- **HyperText Transfer Protocol (HTTP)**—Protocol used to move Web pages across an internet connection. The HTTP protocol is built into Web browsers and Web servers.
- **Interactive Mail Access Protocol (IMAP)**—Provides clients access to e-mail messages and mailboxes over a network. It is incorporated into e-mail applications.
- **Post Office Protocol (POP)**—Allows clients to read and remove e-mail residing on a remote server. It is incorporated into e-mail applications.
- **Remote Login (Rlogin)**—Provides network remote login capability.
- **Simple Mail Transfer Protocol (SMTP)**—Used to deliver email from one system to another. It is incorporated into email applications.

- **Secure Shell (SSH)**—Provides remote access to computers while providing encryption of the data.

Telnet—Provides network terminal, or remote login capability.