

Chapter 10 datacom



Current estimates suggest that there are more than 450 million hosts (computer sites that store and deliver Web pages) connected to the Internet.

T

IP is a connection-oriented protocol. F

Currently, almost all networks involved in the Internet use IP version 6. F

The IP datagram fields Identification, Flags, and Fragment Offset are used to fragment a datagram into smaller parts. T

The Time to Live field indicates how long a particular datagram is allowed to live. T

A 16-bit address uniquely defines a connection to the Internet. F

When the user wants to send an e-mail message, the e-mail program takes the e-mail message and passes it to the transport layer of the software. T

The Window field of the TCP header cannot be set to zero. F

Like its counterpart IP, TCP is a fairly streamlined protocol. T

IP is the protocol used by most networks and network applications to create an error-free, end-to-end network connection. F

The UDP header contains only four fields—Source Port, Destination Port, Length, and Checksum. T

Every device that has a connection to the Internet is assigned an IP address.

T

Home and small business local area networks often use NAT to conserve IP addresses. T

Using a Web browser, you can download and view Web pages on a personal computer. T

The Hypertext Transfer Protocol, or HTTP, is a transport layer protocol. F

Every object on the Internet has a unique English-based address called its Uniform Resource Locator (URL). T

The Internet recognizes URLs directly. F

All Uniform Resource Locators consist of six parts. F

To make IP addresses a little easier for human beings to understand, the 32-bit binary addresses are represented by dotted decimal notation. T

There are six basic forms of a classful IP address: Class A, B, C, D, E, and F. F

IP multicasting suffers from a lack of security. T

Standard Generalized Markup Language (SGML) is a markup language. F

Most HTML tags consist of an opening tag, followed by one or more attributes, and a closing tag. T

HTML pages are simple, static text documents that browsers read, interpret, and display on the screen. T

POP3 is not useful if you do not have a permanent connection to a network and must dial in using a temporary Internet connection. F

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The File Transfer Protocol, or FTP, was one of the first services offered on the Internet. T

H. 323 was originally designed for TCP/IP networks. F

Types of listserv software include mailserv, majordomo, and almanac. T

Intranets use essentially the same hardware and software that is used by other network applications. T

The Internet is a static entity. F

During the late 1960s, a branch of the U. S. government titled the ____ created one of the country's first wide area packet-switched networks. Advanced Research Projects Agency (ARPA)

In 1983, the Department of Defense broke the ARPANET into two similar networks: the original ARPANET and ____ . MILNET

The National Science Foundation funded the creation of a new high-speed, cross-country network backbone called the ____ . NSFnet

The ____ is the main telecommunications line through the network, connecting the major router sites across the country. backbone

To transfer Web pages, the Internet uses the ____ . Hypertext Transfer Protocol (HTTP)

____ are used to select unique documents from anywhere in the world. Uniform Resource Locators (URLs)

The protocol that resides at the ____ layer in the TCP/IP protocol suite is called Internet Protocol (IP). network

The ____ field of an IP datagram contains the version number of IP being used, just in case a new version becomes available. Version

The IP datagram ____ field enables the network to discard a datagram that has been traveling the Internet for too long. Time to Live

The TCP header ____ field contains a 32-bit value that counts bytes and indicates a packet's data position within the connection. Sequence Number

____ is a no-frills transport protocol that does not establish connections, does not attempt to keep data packets in sequence, and does not watch for datagrams that have existed for too long. User Datagram Protocol (UDP)

____ takes an IP address in an IP datagram and translates it into the appropriate medium access control layer address for delivery on a local area network. Address Resolution Protocol (ARP)

____ lets a router represent an entire local area network to the Internet as a single IP address. NAT

A ____ is a data network connection that makes use of the public telecommunications infrastructure but maintains privacy through the use of a tunneling protocol and security procedures. virtual private network (VPN)

The Point-to-Point Tunneling Protocol (PPTP) is an extension of the Internet's _____. Point-to-Point Protocol (PPP)

___ is a set of protocols developed by the Internet Engineering Task Force to support the secure exchange of data packets at the IP layer. IPsec

The Web server software accepts ___ requests from Web browsers connected to the Internet. HTTP

A(n) ___ uniquely identifies files, Web pages, images, or any other types of electronic documents that reside on the Internet. Uniform Resource Locator (URL)

The ___ is a large, distributed database of Internet addresses and domain names. Domain Name System (DNS)

___ is the capability of a network server to transmit a data stream to more than one host at a time. IP multicasting

___ is a set of codes inserted into a document that is intended for display on a Web browser. Hypertext Markup Language (HTML)

___ is a collection of newer markup tags and techniques that can be used to create more flexible and more powerful Web pages. Dynamic HTML (DHTML)

___ is the computerized version of writing a letter and mailing it at the local post office. Electronic mail

An e-mail program creates a(n) ___ document and attaches it to the e-mail message. Multipurpose Internet Mail Extensions (MIME)

The ___ is an Internet protocol for sending and receiving e-mail and is used to perform the transfer. Simple Mail Transfer Protocol (SMTP)

___ is a client/server protocol in which e-mail is received and held for you at your Internet server. Internet Message Access Protocol (IMAP)

The primary functions of ___ are to allow a user to download a file from a remote site to the user's computer and to upload a file from the user's computer to a remote site. File Transfer Protocol (FTP)

___ is a terminal emulation program for TCP/IP networks, such as the Internet, that allows users to log in to a remote computer. Remote login

The practice of making telephone calls over the Internet has had a number of different names, including packet voice, voice over packet, voice over the Internet, Internet telephony, and ____. Voice over IP (VoIP)

A company can use IP for transmission of data within its own network, but use traditional telephone lines outside the company network. Many people are now beginning to call such systems ____. private VoIP

___ is actually a set of protocols named packet-based multimedia protocols, and it was designed for a wide range of applications (audio and video). H.

323

___ is a protocol that converts telephone numbers to fully qualified domain name addresses. ENUM

___ involves the continuous download of a compressed audio or video file, which can then be heard or viewed on the user's workstation. Streaming audio and video

_____ is a common application layer protocols that servers and the Internet use to deliver streaming audio and video data to a user's browser. Real-Time Protocol (RTP)

Real-Time Streaming Protocol (RTSP) is a(n) _____ layer protocol. application

_____ is the electronic selling and buying of merchandise using the Web. E-retailing

_____ is the gathering and use of the browsing habits of potential and current customers, which is important data for many companies. Micro-marketing

A _____ is data created by a Web server that is stored on the hard drive of a user's workstation. cookie

One of the biggest changes to affect the Internet will be the adoption of a new version of the Internet Protocol, version _____. IPv6

There is a plan to implement a newer, very high-speed network that will cover the United States, interconnecting universities and research centers at transmission rates up to a gigabit per second (1000 Mbps). The new high-speed network is called _____. Internet2

During the late 1960s, ARPA created one of the country's first wide area packet-switched networks, the _____. ARPANET

The _____ provides a connectionless data transfer service over heterogeneous networks by passing and routing IP datagrams. Internet Protocol (IP)

IP _____ is essentially another name for a data packet.

datagram

The primary function of _____ is to turn an unreliable network into a reliable network that is free from lost and duplicate packets. Transmission Control Protocol (TCP)

A(n) _____ is a precise identification of a particular application on a particular device. socket

The TCP header _____ field contains a sliding window value that provides flow control between the two endpoints. Window

_____ is a technique that enables a router to switch data quickly from one path onto another path. Multiprotocol Label Switching (MPLS)

The _____, which is used by routers and nodes, performs error reporting for the Internet Protocol. Internet Control Message Protocol (ICMP)

The most popular protocol that handles dynamic assignment of IP addresses is _____. Dynamic Host Configuration Protocol (DHCP)

A(n) _____ is the command set that allows an organization to create secure connections using public resources such as the Internet. tunneling protocol

The _____ is a vast collection of electronic documents that are located on many different Web servers and contain text and images that can be accessed by simply clicking links within a browser's Web page. World Wide Web (WWW)

The _____ portion of the URL specifies a particular server at a particular site that contains the requested item. domain name

The basic idea behind _____ is to take the host ID portion of an IP address and further divide it into a subnet ID and a host ID. subnet masking

_____ allow a Web page author to incorporate multiple styles (fonts, styles, colors, and so on) in an individual HTML page. Cascading style sheets (CSS)

_____ is a subset of SGML and is a specification for how to create a document—the specification covers both the definition of the document and the contents of the document. Extensible Markup Language (XML)

_____ combines HTML, dynamic HTML, and XML into one standard and should eventually replace HTML. eXtensible Hypertext Markup Language (XHTML)

_____ is the software that allows the user to save e-mail messages in a server mailbox and download them when desired from the server. Post Office Protocol version 3 (POP3)

The _____ can perform the digitization, compression, and encapsulation required, and it controls the setup of VoIP calls between the calling device and the called device. VoIP gateway

_____ was introduced in 1998 by the Internet Engineering Task Force specifically for supporting the transfer of voice over the Internet. Session Initiation Protocol (SIP)

A(n) _____ is a popular software program used to create and manage Internet mailing lists. listserv

_____ allows a user to see if people are currently logged in on the network and, if they are, to send them short messages in real time. Instant messaging (IM)

The term that has come to represent a business's commercial dealings over the Internet is _____. e-commerce

_____ is the electronic commercial transaction between two or more companies. Electronic data interchange (EDI)

A(n) _____ is a TCP/IP network inside a company that allows employees to access the company's information resources through an Internet-like interface. intranet

When an intranet is extended outside the corporate walls to include suppliers, customers, or other external agents, it becomes a(n) _____. extranet

How does the Internet Protocol work? The Internet Protocol (IP) provides a connectionless data transfer service over heterogeneous networks by passing and routing IP datagrams. IP datagram is essentially another name for a data packet. To be passed and routed on the Internet, all IP datagrams or packets that are passed down from the transport layer to the network layer are encapsulated with an IP header that contains the information necessary to transmit the packet from one network to another. The format of this header will be explained in the next few paragraphs.

Consider the example of a workstation performing a network operation such as sending an e-mail message to a distant workstation. Suppose both workstations are on local area networks, and the two local area networks are connected via a wide area network. As the local workstation sends the e-mail packet down through the layers of the first internal network, the IP header is encapsulated over the transport layer packet, creating the IP datagram. The appropriate MAC layer headers are encapsulated over the IP datagram, creating a frame, and this frame is sent through LAN 1 to the first router. Because the router interfaces LAN 1 to a wide area network, the MAC layer information is stripped off, leaving the IP datagram. At this time, the router may use any or all of the IP information to perform the necessary internetworking functions. The necessary wide area network level information is applied, and the packet is sent over the WAN to Router 2. When the packet arrives at the second router, the wide area network information is stripped off, once again leaving the IP datagram. The appropriate MAC layer information is then applied for transfer of the frame

over LAN 2, and the frame is transmitted. Upon arrival at the remote workstation, all header information is removed, leaving the original data.

How does a TCP make a network more reliable? To make a network more reliable, TCP (as well as most transport layer protocols) performs the following six functions:

- * Create a connection—The TCP header includes a port address that indicates a particular application on a machine. Used in conjunction, the port address and the IP address identify a particular application of a particular machine. When TCP creates a connection between a sender and a receiver, the two ends of the connection use a port number to identify the particular application's connection. This port number is found within the TCP datagram and is passed back and forth between sender and receiver.
- * Release a connection—The TCP software can also dissolve a connection after all the data has been sent and received.
- * Implement flow control—To make sure the sending station does not overwhelm the receiving station with too much data, the TCP header includes a field, called the Window value, that allows the receiver to tell the sender to slow down. This Window value is similar in operation to the sliding window used at the data link layer. The difference between the two window operations is that the data link layer's sliding window operates between two nodes or between a workstation and a node, while the TCP window operates between the two endpoints (sender and receiver) of a network connection.
- * Establish multiplexing—Because the TCP header includes a port number instead of an IP address, it is possible to multiplex multiple connections over a single IP connection. This multiplexing can be done by creating a different

connection that has a port number different from a previous connection.

* Perform error recovery—TCP numbers each packet for transmission with a sequence number. As the packets arrive at the destination site, the receiving TCP software checks these sequence numbers for continuity. If there is a loss of continuity, the receiving TCP software uses an acknowledgment number to inform the sending TCP software of a possible error condition.

* Establish priority—If the sender has to transmit data of a higher priority, such as an error condition, TCP can set a value in a field (the Urgent Pointer) that indicates that all or a portion of the enclosed data is of an urgent nature.

How does NAT work? When a user workstation on a company local area network sends a packet out to the Internet, NAT replaces the IP address of the user workstation with a corporate global IP address. In fact, all packets that leave the corporate network contain this global IP address. Thus, the only IP address that anyone sees outside of the corporate network is the one global IP address. If all packets from all workstations leave the corporate network with the same IP address, how do the responses that come back from the Internet get directed to the proper machine? The NAT software maintains a cache listing of all IP packets that were sent out and who sent each packet. When a response comes back, NAT checks the cache to see who originally sent the request. When NAT finds the match, it removes the global IP address, reinserts the user workstation's IP address, and places the packet on the corporate network.

What happens if a packet arrives at the corporate NAT software and there is no cache entry with a matching outgoing request? In this case, the packet is

destroyed. Apparently, someone has sent a packet to the corporate network that was not requested by a corporate workstation. There is one exception to this rule: If the company is supporting a server, such as a Web server, a packet may originate from a user somewhere out on the Internet. When the Web page request packet arrives at the NAT software, the IP address where the packet originated will not match any IP addresses in the local cache. Before the NAT software destroys the packet, it examines the message's destination port number. If the packet is a request for a Web page from the corporate Web server, the NAT software lets the packet in.

Briefly explain some of the more common HTTP methods. HTTP can perform a number of different commands called methods. A few of the more common methods are the following:

- * GET—Retrieves a particular Web page, which is identified by a URL
- * HEAD—Uses a given URL to retrieve only the HTTP headers (not the document body) of the Web page
- * PUT—Sends data from a user's browser to a remote Web site (this method is used, for example, to send a buyer's credit card number to a Web merchant during a purchasing transaction)
- * DELETE—Requests that a server delete the information corresponding to a given URL

What are the disadvantages of Voice over IP (VoIP)? Voice over IP has a number of disadvantages as well. The statement that sending data over the Internet is essentially free is misleading. Nothing, of course, is free. All Internet users must pay an Internet service provider for access, the

interconnecting phone line, and any necessary hardware and software. Also, even more additional hardware and software is necessary to handle the transmission of voice packets over a corporate data network. Nonetheless, if you already have high-speed Internet access, adding VoIP may be a reasonable way to obtain both local and long-distance telephone service.

A second, and more important disadvantage, is that transmitting voice over a corporate network can be demanding on the network's resources. If the current corporate network system is straining to deliver data, adding voice to this system can cause severe service problems. These service problems can be compounded because voice systems require networks that can pass the voice data through in a relatively small amount of time. A network that delays voice data by more than 20 milliseconds from end to end will introduce a noticeable echo into the transmission. If the delay becomes longer than 250 milliseconds (that's only a quarter of a second), the system will be basically unusable.

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