MODUL PERKULIAHAN ELEARNING
MATA KULIAH - MCM 205 – ECOMMERCE (3 SKS)

PERTEMUAN 7 – *ELEARNING*

Tampilan Antar Muka (*Interface*) *Website*

Dosen
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Sumber penulisan modul:
Kenneth C. Laudon and Carol Guercio Traver. 2014. *e-Commerce Business Technology Society*. 10th Edition. New Jersey: Pearson. Halaman 106-181.

The Internet: Technology Background

The Internet is an interconnected network of thousands of networks and millions of computers (sometimes called host computers or just hosts) linking businesses, educational institutions, government agencies, and individuals. The Internet provides approximately 2.56 billion people around the world (including about 243 million people in the United States) with services such as e-mail, apps, newsgroups, shopping, research, instant messaging, music, videos, and news (eMarketer, Inc., 2013a, 2013b). No single organization controls the Internet or how it functions, nor is it owned by anybody, yet it has provided the infrastructure for a transformation in commerce, scientific research, and culture. The word Internet is derived from the word internetwork, or the connecting together of two or more computer networks.

> **Internet**, an interconnected network of thousands of networks and millions of computers linking businesses, educational institutions, government agencies, and individuals

The Web is one of the Internet's most popular services, providing access to billions, perhaps trillions, of Web pages, which are documents created in a programming language called HTML that can contain text, graphics, audio, video, and other objects, as well as "hyperlinks" that

permit users to jump easily from one page to another. Web pages are navigated using browser software.

the Web one of the Internet's most popular services, providing access to more than 100 billion Web pages

Table 1	Trends in E-commerce Infrastructure 2013–2014

BUSINESS

1) Mobile devices become the primary access point to social network services and a rapidly expanding social marketing and advertising platform, and create a foundation for location-based Web services and business models.
2) Explosion of Internet content services and mobile access devices strains the business models of Internet backbone providers (the large telecommunication carriers).
3) The growth in cloud computing and bandwidth capacity enables new business models for distributing music, movies, and television.
4) Search becomes more social and local, enabling social and local commerce business models.
5) Internet backbone carriers initiate differential pricing models so that users pay for bandwidth usage.
6) "Big data" produced by the Internet creates new business opportunities for firms with the analytic capability to understand it.

TECHNOLOGY

1) Mobile devices such as smartphones and tablet computers are well on their way to becoming the dominant mode of access to the Internet. The new client is mobile.
2) The explosion of mobile apps threatens the dominance of the Web as the main source of online software applications and leads some to claim "the Web is dead."
3) HTML5 grows in popularity among publishers and developers and makes possible Web applications that are just as visually rich and lively as so-called native mobile apps.
4) Cloud computing reshapes computing and storage, and becomes an important force in the delivery of software applications and online content.
5) The Internet runs out of IPv4 addresses; transition to IPv6 begins.
6) The shipment of tablet computers exceeds the shipment of PCs.
7) The decreased cost of storage and advances in database software leads to explosion in online data collection known as "big data," and creates new business opportunities for firms with the analytic capability to understand it.
8) The Internet of Things, with millions of sensor-equipped devices connecting to the Internet, starts to become a reality.

SOCIETY
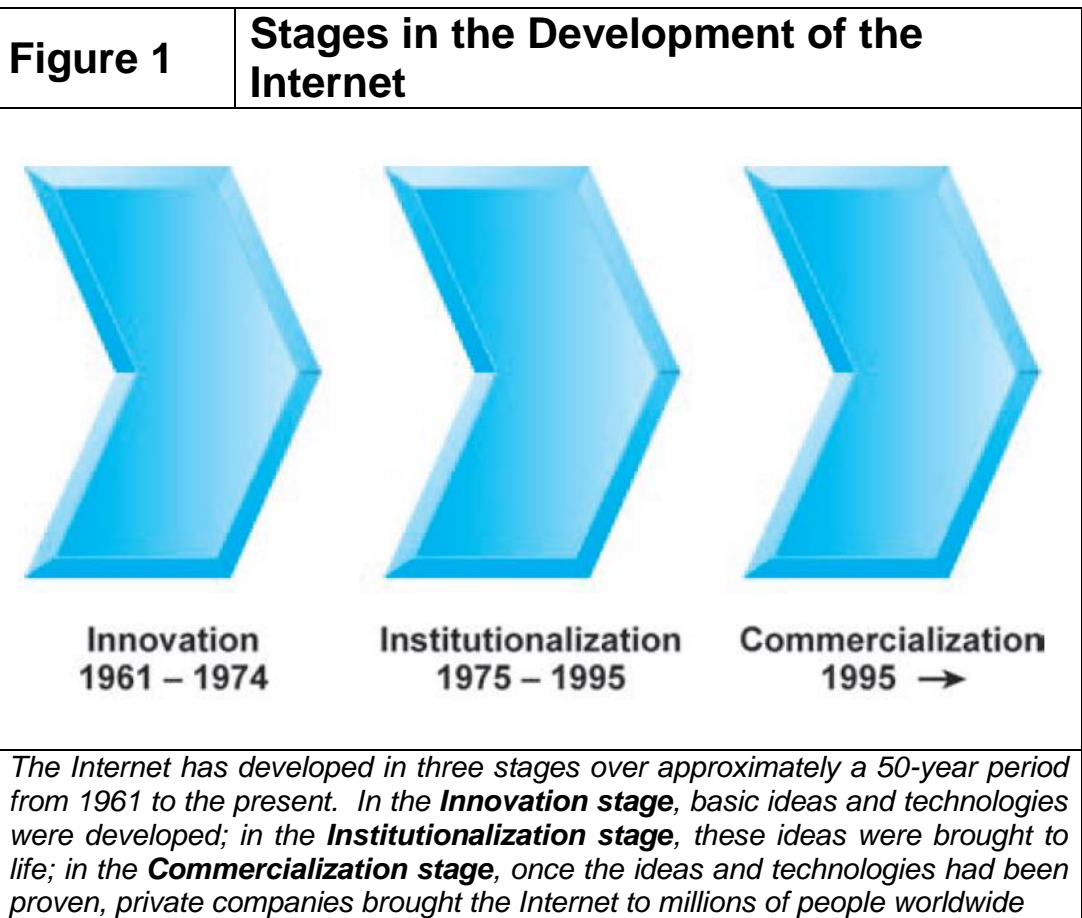
1) ICANN, which manages the Internet's domain name system, okays

vast expansion of top-level domain names.
2) Governance of the Internet becomes more involved with conflicts between nations.
3) Government control over, and surveillance of, the Internet is expanded in most advanced nations, and in many nations the Internet is nearly completely controlled by government agencies.
4) The growing Web-based infrastructure for tracking online and mobile consumer behavior conflicts with individual claims to privacy and control over personal information.

The Evolution of the Internet: 1961—the Present

In the first phase, the Innovation Phase, from 1961 to 1974, the fundamental building blocks of the Internet were conceptualized and then realized in actual hardware and software. The basic building blocks are packet-switching hardware, a communications protocol called TCP/IP, and client/server computing. The original purpose of the Internet, when it was conceived in the 1960s, was to link large mainframe computers on different college campuses. This kind of one-to-one communication between campuses was previously only possible through the telephone system or private networks owned by the large computer manufacturers.

Figure 1	**Stages in the Development of the Internet**

Innovation 1961 – 1974

Institutionalization 1975 – 1995

Commercialization 1995 →

*The Internet has developed in three stages over approximately a 50-year period from 1961 to the present. In the **Innovation stage**, basic ideas and technologies were developed; in the **Institutionalization stage**, these ideas were brought to life; in the **Commercialization stage**, once the ideas and technologies had been proven, private companies brought the Internet to millions of people worldwide*

In **the second phase, the Institutionalization Phase**, from 1975 to 1995, large institutions such as the Department of Defense (DoD) and the National Science Foundation (NSF) provided funding and legitimization for the fledging invention called the Internet. Once the concepts behind the Internet had been proven in several government-supported demonstration projects, the DoD contributed $1 million to further develop them into a robust military communications system that could withstand nuclear war. This effort created what was then called ARPANET (Advanced Research Projects Agency Network).

In 1986, the NSF assumed responsibility for the development of a civilian Internet (then called NSFNET) and began a 10-year-long $200 million expansion program. In the **third phase, the Commercialization Phase**, from 1995 to the present, government agencies encouraged private corporations to take over and expand both the Internet backbone and local service to ordinary citizens—families and individuals across America and the world who were not students on campuses. By 2000, the Internet's use had expanded well beyond military installations and research universities.

The Internet: Key Technology Concepts

In 1995, the **Federal Networking Council** (FNC) passed a resolution formally defining the term **Internet as a network that uses the IP addressing scheme**, supports the **Transmission Control Protocol** (TCP), and makes services available to users much like a telephone system makes voice and data services available to the public.

Behind this formal definition are **three extremely important concepts** that are the basis for understanding the Internet: (1) packet switching; (2) the TCP/IP communications protocol, and (3) client/server computing. Although the Internet has evolved and changed dramatically in the last 30 years, these three concepts are at the core of the way the Internet functions today and are the foundation for the Internet of the future.
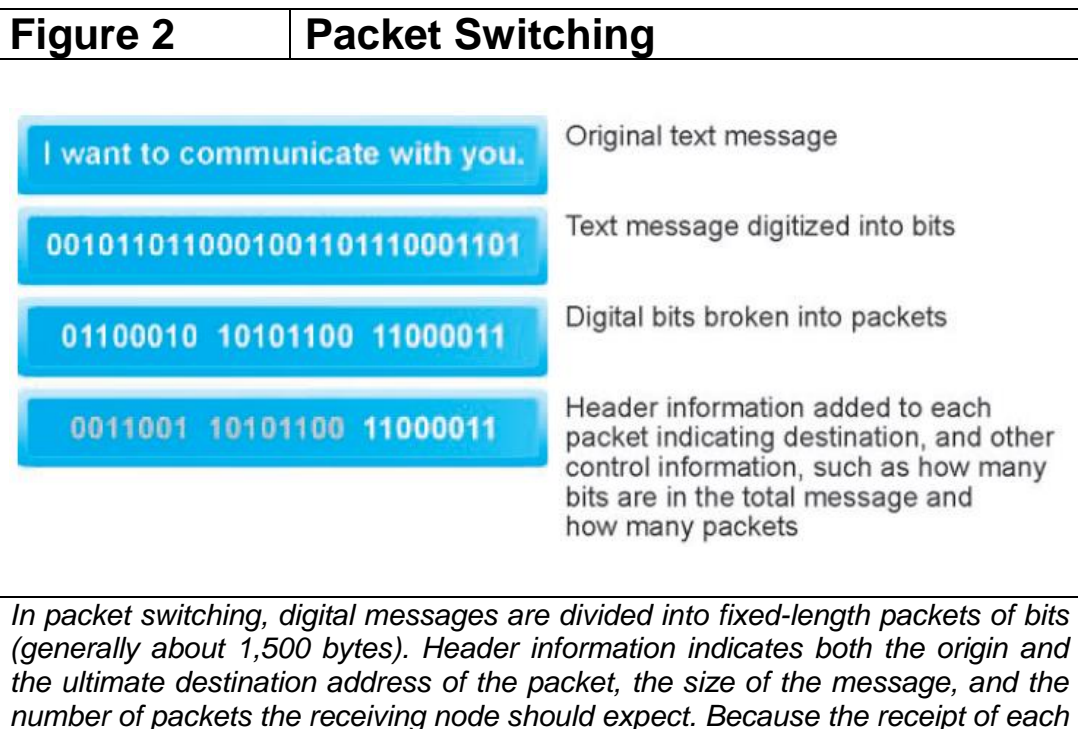
Packet Switching

Packet switching is a method of slicing digital messages into discrete units called packets, sending the packets along different communication paths as they become available, and then reassembling the packets once they arrive at their destination (see **Figure 2**). Prior to the development of packet switching, early computer networks used leased, dedicated telephone circuits to communicate with terminals and other computers. In circuit-switched networks such as the telephone system, a complete point-to-point circuit is put together, and then communication can proceed. However, these "dedicated" circuit-switching techniques were expensive and wasted available communications capacity—the circuit would be maintained regardless of whether any data

was being sent. For nearly 70% of the time, a dedicated voice circuit is not being fully used because of pauses between words and delays in assembling the circuit segments, both of which increase the length of time required to find and connect circuits. A better technology was needed.

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packet switching a method of slicing digital messages into packets, sending the packets along different communication paths as they become available, and then reassembling the packets once they arrive at their destination

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Packets the discrete units into which digital messages are sliced for transmission over the Internet

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The first book on packet switching was written by Leonard Kleinrock in 1964 (Kleinrock, 1964), and the technique was further developed by others in the defense research labs of both the United States and England. With packet switching, the communications capacity of a network can be increased by a factor of 100 or more. (The communications capacity of a digital network is measured in terms of bits per second - A bit is a binary digit, 0 or 1. A string of eight bits constitutes a byte. A home telephone dial-up modem connects to the Internet usually at 56 Kbps, 56,000 bits per second. Mbps refers to millions of bits per second, whereas Gbps refers to billions of bits per second). Imagine if the gas mileage of your car went from 15 miles per gallon to 1,500 miles per gallon—all without changing too much of the car!

Figure 2	**Packet Switching**

I want to communicate with you.	Original text message
0010110110001001101110001101	Text message digitized into bits
01100010 10101100 11000011	Digital bits broken into packets
0011001 10101100 11000011	Header information added to each packet indicating destination, and other control information, such as how many bits are in the total message and how many packets

In packet switching, digital messages are divided into fixed-length packets of bits (generally about 1,500 bytes). Header information indicates both the origin and the ultimate destination address of the packet, the size of the message, and the number of packets the receiving node should expect. Because the receipt of each

> *packet is acknowledged by the receiving computer, for a considerable amount of time, the network is not passing information, only acknowledgments, producing a delay called latency*

In packet-switched networks, messages are first broken down into packets. Appended to each packet are digital codes that indicate a source address (the origination point) and a destination address, as well as sequencing information and error control information for the packet. Rather than being sent directly to the destination address, in a packet network, the packets travel from computer to computer until they reach their destination. These computers are called routers. A **router** is a special purpose computer that interconnects the different computer networks that make up the Internet and routes packets along to their ultimate destination as they travel. To ensure that packets take the best available path toward their destination, routers use a computer program called a **routing algorithm**.

> **Router** special-purpose computer that interconnects the computer networks that make up the Internet and routes packets to their ultimate destination as they travel the Internet

> **Routing algorithm** computer program that ensures that packets take the best available path toward their destination

Packet switching does not require a dedicated circuit, but can make use of any spare capacity that is available on any of several hundred circuits. Packet switching makes nearly full use of almost all available communication lines and capacity. Moreover, if some lines are disabled or too busy, the packets can be sent on any available line that eventually leads to the destination point.

IP Addresses

The IP addressing scheme answers the question "How can billions of computers attached to the Internet communicate with one another?" The answer is that every computer connected to the Internet must be assigned an address—otherwise it cannot send or receive TCP packets. For instance, when you sign onto the Internet using a dial-up, DSL, or cable modem, your computer is assigned a temporary address by your Internet Service Provider. Most corporate and university computers attached to a local area network have a permanent IP address.

Figure 3	The TCP/IP Architecture and Protocol Suite
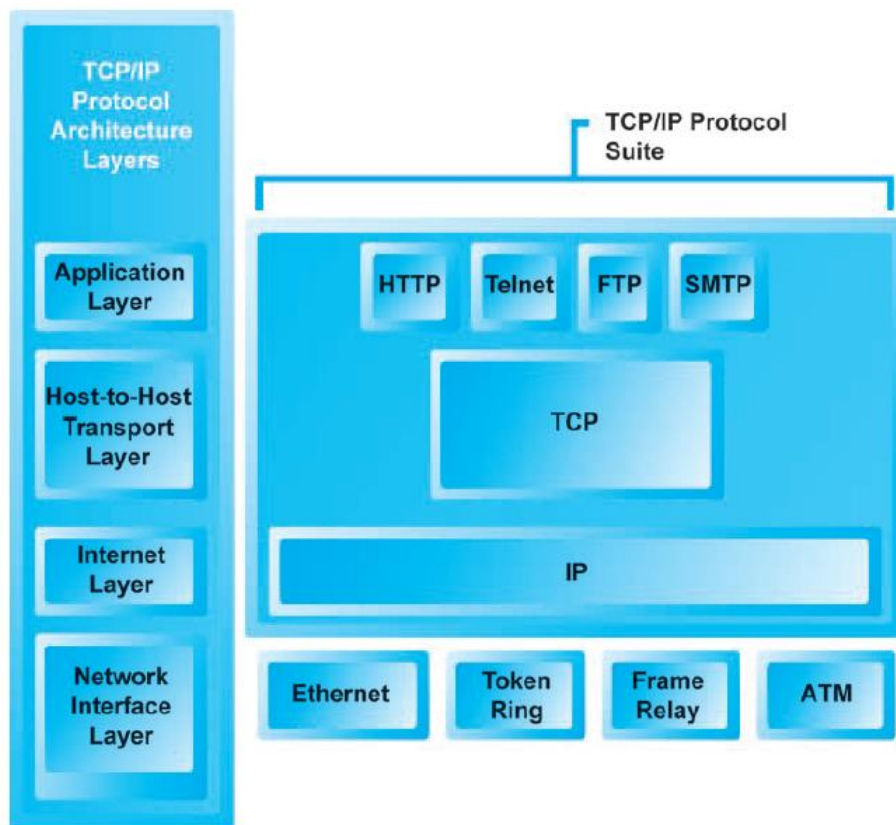
TCP/IP is an industry-standard suite of protocols for large internetworks. The purpose of TCP/IP is to provide high-speed communication network links.

There are two versions of IP currently in use: IPv4 and IPv6. An **IPv4 Internet address** is a 32-bit number that appears as a series of four separate numbers marked off by periods, such as 64.49.254.91. Each of the four numbers can range from 0–255. This "dotted quad" addressing scheme supports up to about 4 billion addresses (2 to the 32nd power). In a typical Class C network, the first three sets of numbers identify the network (in the preceding example, 64.49.254 is the local area network identification) and the last number (91) identifies a specific computer.
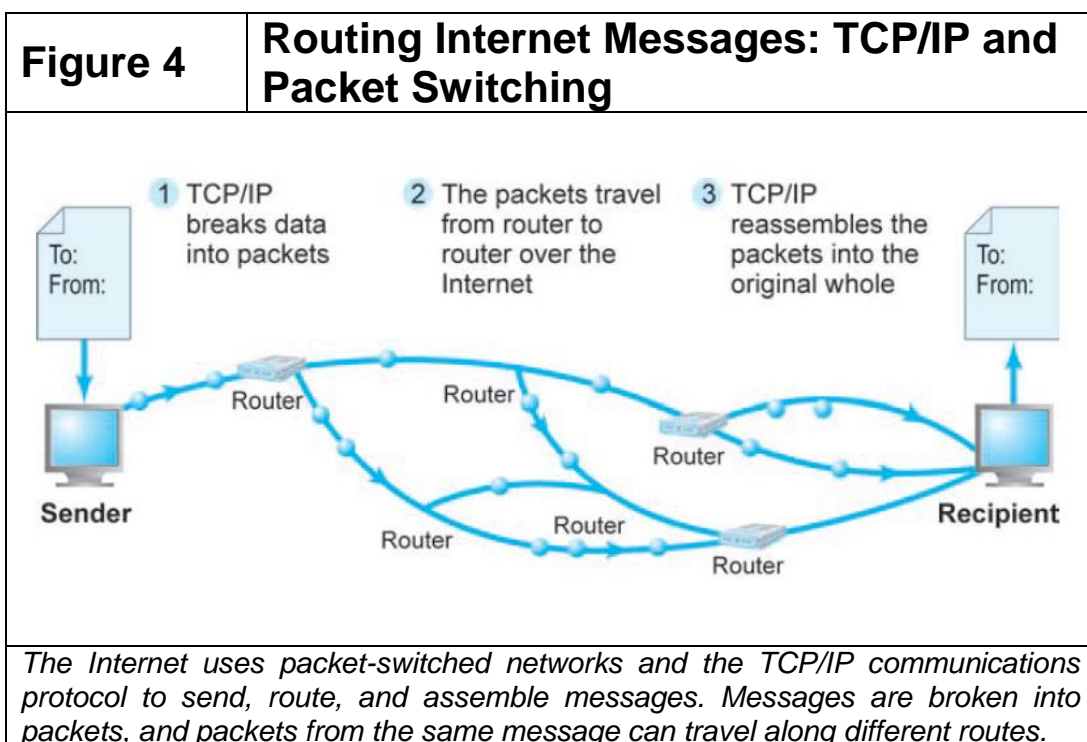
IPv4 Internet address Internet address expressed as a 32-bit number that appears as a series of four separate numbers marked off by periods, such as 64.49.254.91

Because many large corporate and government domains have been given millions of IP addresses each (to accommodate their current

and future work forces), and with all the new networks and new Internet-enabled devices requiring unique IP addresses being attached to the Internet, by 2011, there were only an estimated 76 million IPv4 addresses left, declining at the rate of 1 million per week. IPv6 was created to address this problem. An **IPv6 Internet address** is 128 bits, so it can support up to 2128 (3.4×1038) addresses, many more than IPv4.

IPv6 Internet address Internet address expressed as a 128-bit number

Figure 4 illustrates how TCP/IP and packet switching work together to send data over the Internet.

Figure 4	**Routing Internet Messages: TCP/IP and Packet Switching**

The Internet uses packet-switched networks and the TCP/IP communications protocol to send, route, and assemble messages. Messages are broken into packets, and packets from the same message can travel along different routes.

Domain Names, DNS, and URLs

Most people cannot remember 32-bit numbers. An IP address can be represented by a natural language convention called a domain name. The **Domain Name System** (DNS) allows expressions such as Cnet.com to stand for a numeric IP address (cnet. com's numeric IP is 216.239.113.101 (You can check the IP address of any domain name on the Internet. In Windows 7 or Vista, use Start/ cmd to open the DOS prompt. Type ping <Domain Name>. You will receive the IP address in return) . A **Uniform Resource Locator** (URL), which is the address used by a Web browser to identify the location of content on the Web, also uses a domain name as part of the URL. A typical URL contains the protocol to be used when accessing the address, followed by its location. For instance, the URL http://www.azimuth-interactive.com/flash_test refers to

the IP address 208.148.84.1 with the domain name "azimuth interactive.com" and the protocol being used to access the address, HTTP. A resource called "flash_test" is located on the server directory path /flash_test. A URL can have from two to four parts; for example, name1.name2.name3.org.

Figure 5 illustrates the Domain Name System and Table 2 summarizes the important components of the Internet addressing scheme

domain name IP address expressed in natural language

Domain Name System (DNS) system for expressing numeric IP addresses in natural language

Uniform Resource Locator (URL) the address used by a Web browser to identify the location of content on the Web

Figure 5	**The Hierarchical Domain Name System**
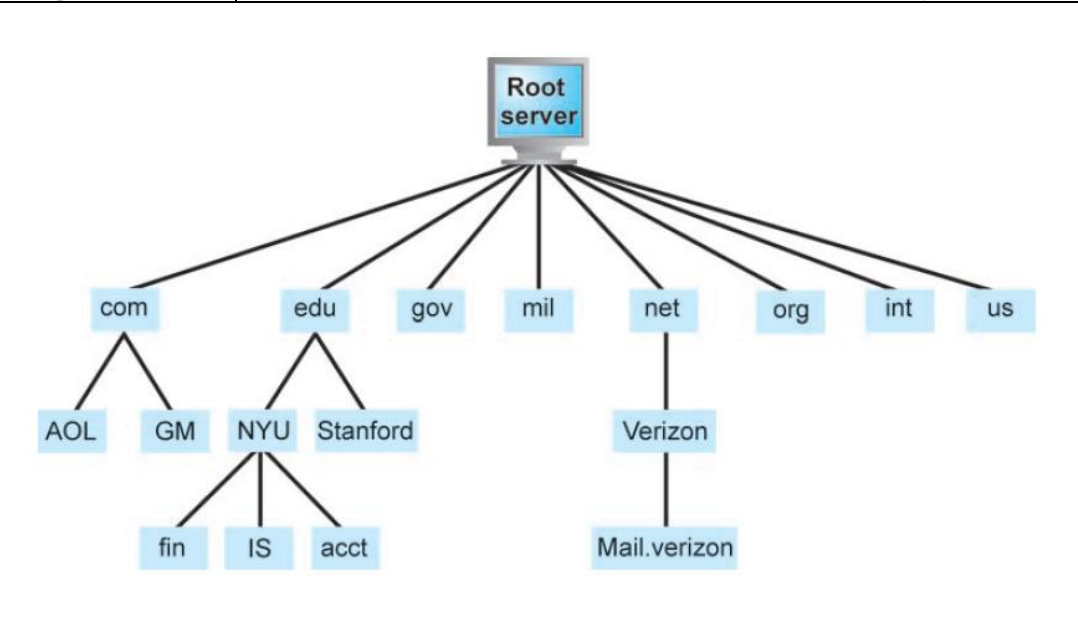
The Domain Name System is a hierarchical namespace with a root server at the top. Top-level domains appear next and identify the organization type (such as .com, .gov, .org, etc.) or geographic location (such as .uk [Great Britain] or .ca [Canada]). Second-level servers for each top-level domain assign and register second-level domain names for organizations and individuals such as IBM.com, Microsoft.com, and Stanford.edu. Finally, third-level domains identify a particular computer or group of computers within an organization, e.g., www.finance.nyu.edu.

| Table 2	Pieces of the Internet Puzzle: Names and Addresses
IP addresses	Every device connected to the Internet must have a unique address number called an Internet
Protocol (IP) address	Domain names The Domain Name System allows expressions such as Pearsoned.com (Pearson Education's Web site) to stand for numeric IP locations.
DNS servers	DNS servers are databases that keep track of IP addresses and domain names on the Internet.
Root servers .	Root servers are central directories that list all domain names currently in use for specific domains; for example, the .com root server. DNS servers consult root servers to look up unfamiliar domain names when routing traffic

Client/Server Computing

While packet switching exploded the available communications capacity and TCP/IP provided the communications rules and regulations, it took a revolution in computing to bring about today's Internet and the Web. That revolution is called client/server computing and without it, the Web—in all its richness—would not exist. **Client/server computing** is a model of computing in which powerful personal computers and other Internet devices called **clients** are connected in a network to one or more server computers. These clients are sufficiently powerful to accomplish complex tasks such as displaying rich graphics, storing large files, and processing graphics and sound files, all on a local desktop or handheld device. **Servers** are networked computers dedicated to common functions that the client computers on the network need, such as file storage, software applications, utility programs that provide Web connections, and printers (see **Figure 6**). The Internet is a giant example of client/server computing in which millions of Web servers located around the world can be easily accessed by millions of client computers, also located throughout the world.

client/server computing a model of computing in which powerful personal computers are connected in a network together with one or more servers.

Client a powerful personal computer that is part of a network

Server networked computer dedicated to common functions that the client computers on the network need.

Figure 6	**The Client/server Computing Model**
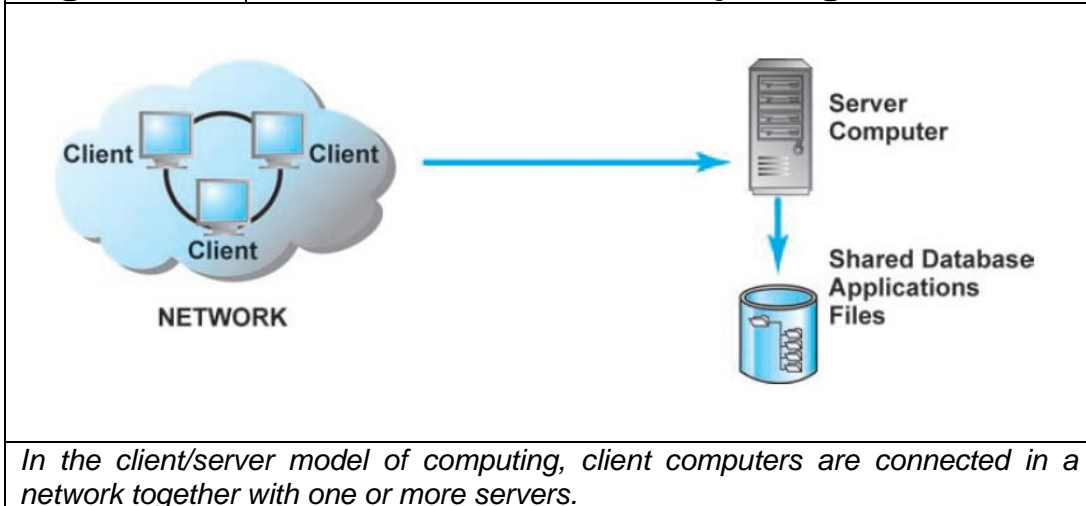
In the client/server model of computing, client computers are connected in a network together with one or more servers.

The New Client: the Mobile Platform

There's a new client in town. In a few years, the primary means of accessing the Internet both in the United States and worldwide will be through highly portable smartphones and tablet computers, and not traditional desktop or laptop PCs. This means that the primary platform for e-commerce products and services will also change to a mobile platform.

The change in hardware has reached a tipping point. The form factor of PCs has changed from desktops to laptops and tablet computers such as the iPad (and more than 100 other competitors). Tablets are lighter, do not require a complex operating system, and rely on the Internet cloud to provide processing and storage. And, while there are an estimated 1.6 billion PCs in the world, the number of cell phones long ago exceeded the population of PCs. In 2013, there are an estimated 4.3 billion worldwide mobile phone users, with 247 million in the United States, around 1 billion in China, and 525 million in India. The population of mobile phone users is almost three times that of PC owners. About 33%, or 1.4 billion, of the world's mobile phone users are smartphone users. In the United States, about 143 million people access the Internet using mobile devices, mostly smartphones and tablets (eMarketer, Inc., 2013c, 2013d, 2013e). Briefly, the Internet world is turning into a lighter, mobile platform. The tablet is not replacing PCs so much as supplementing PCs for use in mobile situations.

Smartphones are a disruptive technology that radically alters the personal computing and e-commerce landscape. Smartphones involve a major shift in computer processors and software that is disrupting the 40-year dual monopolies established by Intel and Microsoft, whose chips, operating systems, and software applications have dominated the PC

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market since 1982. Few cell phones use Intel chips, which power 90% of the world's PCs; only a small percentage of smartphones use Microsoft's operating system (Windows Mobile). Instead, smartphone manufacturers either purchase operating systems such as Symbian, the world leader, or build their own, such as Apple's iPhone iOS and BlackBerry's OS, typically based on Linux and Java platforms. Cell phones do not use power-hungry hard drives but instead use flash memory chips with storage up to 32 megabytes that also require much less power.

The mobile platform has profound implications for e-commerce because it influences how, where, and when consumers shop and buy.

Other Internet Protocols and Utility Programs

There are many other Internet protocols and utility programs that provide services to users in the form of Internet applications that run on Internet clients and servers. These Internet services are based on universally accepted protocols—or standards—that are available to everyone who uses the Internet. They are not owned by any organization, but they are services that have been developed over many years and made available to all Internet users.

Internet Protocols: HTTP, E-mail Protocols, FTP, Telnet, and SSL/TLS

Hyper Text Transfer Protocol (HTTP) is the Internet protocol used to transfer Web pages (described in the following section). HTTP was developed by the World Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF). HTTP runs in the Application Layer of the TCP/IP model shown in Figure 3.4 on page 119. An HTTP session begins when a client's browser requests a resource, such as a Web page, from a remote Internet server. When the server responds by sending the page requested, the HTTP session for that object ends. Because Web pages may have many objects on them—graphics, sound or video files, frames, and so forth—each object must be requested by a separate HTTP message. For more information about HTTP, you can consult RFC 2616, which details the standards for HTTP/1.1, the version of HTTP most commonly used today (Internet Society, 1999). (An RFC is a document published by the Internet Society [ISOC] or one of the other organizations involved in Internet governance that sets forth the standards for various Internet-related technologies.

Hyper Text Transfer Protocol (HTTP) the Internet protocol used for transferring Web pages

E-mail is one of the oldest, most important, and frequently used Internet services. Like HTTP, the various Internet protocols used to handle e-mail all run in the Application Layer of TCP/IP. **Simple Mail Transfer Protocol** (SMTP) is the Internet protocol used to send e-mail to a server.

SMTP is a relatively simple, text-based protocol that was developed in the early 1980s. SMTP handles only the sending of e-mail. To retrieve e-mail from a server, the client computer uses either **Post Office Protocol** 3 (POP3) or **Internet Message Access Protocol** (IMAP). You can set POP3 to retrieve e-mail messages from the server and then delete the messages on the server, or retain them on the server. IMAP is a more current e-mail protocol supported by all browsers and most servers and ISPs. IMAP allows users to search, organize, and filter their mail prior to downloading it from the server.

Simple Mail Transfer Protocol (SMTP) the Internet protocol used to send mail to a server

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Post Office Protocol 3 (POP3) a protocol used by the client to retrieve mail from an Internet server

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Internet Message Access Protocol (IMAP) a more current e-mail protocol that allows users to search, organize, and filter their mail prior to downloading it from the server

File Transfer Protocol (FTP) one of the original Internet services. Part of the TCP/IP protocol that permits users to transfer files from the server to their client computer, and vice versa

Telnet a terminal emulation program that runs in TCP/IP

Secure Sockets Layer (SSL) /Transport Layer Security (TLS) protocols that secure communications between the client and the server

File Transfer Protocol (FTP) is one of the original Internet services. FTP runs in TCP/IP's Application Layer and permits users to transfer files from a server to their client computer, and vice versa. The files can be documents, programs, or large database files. FTP is the fastest and most convenient way to transfer files larger than 1 megabyte, which some e-mail servers will not accept. More information about FTP is available in RFC 959 (Internet Society, 1985).

Telnet is a network protocol that also runs in TCP/IP's Application Layer and is used to allow remote login on another computer. The term Telnet also refers to the Telnet program, which provides the client part of the protocol and enables the client to emulate a mainframe computer terminal. (The industry-standard terminals defined in the days of mainframe computing are VT-52, VT-100, and IBM 3250.) You can then attach yourself to a computer on the Internet that supports Telnet and run programs or download files from that computer. Telnet was the first "remote work" program that permitted users to work on a computer from a remote location.

Secure Sockets Layer (SSL)/**Transport Layer Security** (TLS) are protocols that operate between the Transport and Application Layers of TCP/IP and secure communications between the client and the server. SSL/TLS helps secure e-commerce communications and payments through a variety of techniques, such as message encryption and digital signatures.

(Silakan dibaca pada eBook yang telah dituliskan di atas)
The Internet Today
The Future Internet Infrastructure
The Web
The Internet and the Web: Features and Services
Mobile Apps: The Next Big Thing Is Here