

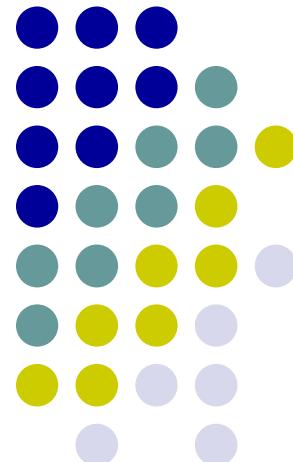
# Bài 2. Công nghệ thông tin trong HTTT

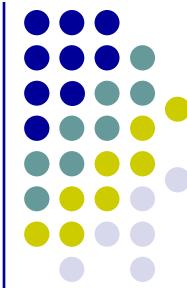
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**Nguyễn Văn Giang**

Viện CNTT&TT

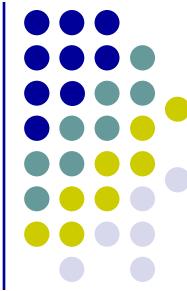
Học viện kỹ thuật quân sự



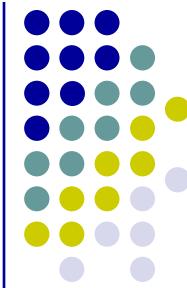


# NỘI DUNG

- Hạ tầng CNTT trong HTTT.
- Phần cứng.
- Phần mềm.
- Hệ quản trị CSDL và quản lý thông tin.
- Mạng máy tính



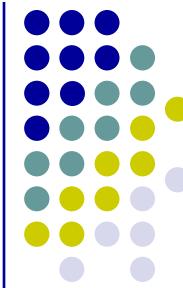
# **Hạ tầng CNTT trong HTTT**



# Hạ tầng Công nghệ thông tin

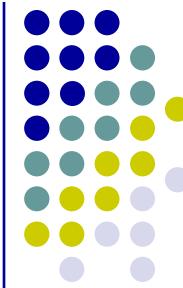
- ...là tập các thiết bị vật lý (physical devices) và các ứng dụng phần mềm (software apps) cần thiết để vận hành cả tổ chức

# Các dịch vụ trong Hạ tầng CNTT (1)



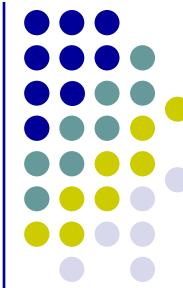
- Nền tảng điện toán để kết nối nhân viên, khách hàng, và nhà cung cấp
  - Large mainframes
  - Midrange computers
  - PC/Laptop
  - Mobile handheld
  - Cloud Computing Services

# Các dịch vụ trong Hạ tầng CNTT (2)



- Dịch vụ viễn thông cung cấp các kết nối data, voice, video cho nhân viên, khách hàng, và nhà cung cấp

# Các dịch vụ trong Hạ tầng CNTT (3)



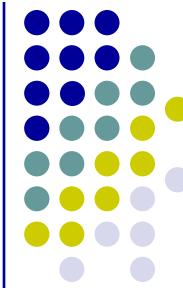
- **Dịch vụ quản trị dữ liệu lưu trữ và quản trị dữ liệu** của cơ quan tổ chức và cung cấp khả năng phân tích dữ liệu.

# Các dịch vụ trong Hạ tầng CNTT

## (4)

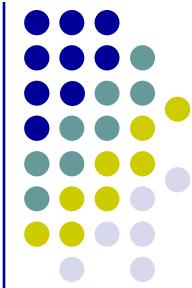
- Dịch vụ phần mềm ứng dụng

# Các dịch vụ trong Hạ tầng CNTT (5)



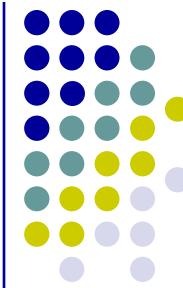
- **Dịch vụ quản lý cơ sở hạ tầng vật lý**

# Các dịch vụ trong Hạ tầng CNTT (6)



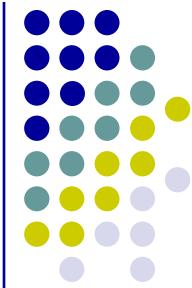
- Dịch vụ quản lý IT

# Các dịch vụ trong Hạ tầng CNTT (7)



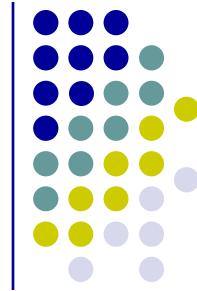
- **Dịch vụ về tiêu chuẩn IT (IT standards services)**

# Các dịch vụ trong Hạ tầng CNTT (8)



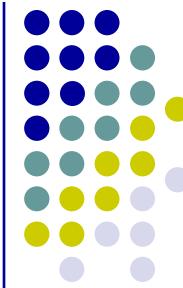
- Dịch vụ đào tạo IT

# Các dịch vụ trong Hạ tầng CNTT (9)

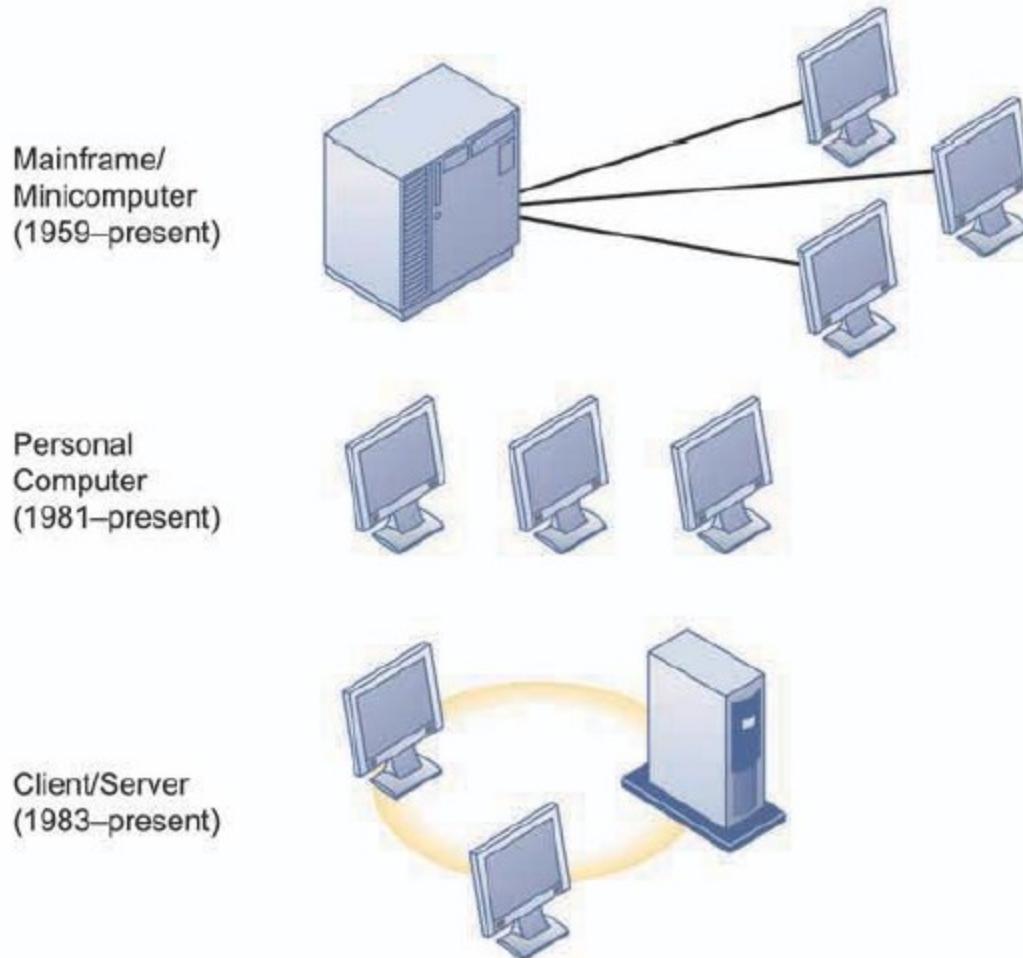


- **Dịch vụ nghiên cứu và phát triển IT**

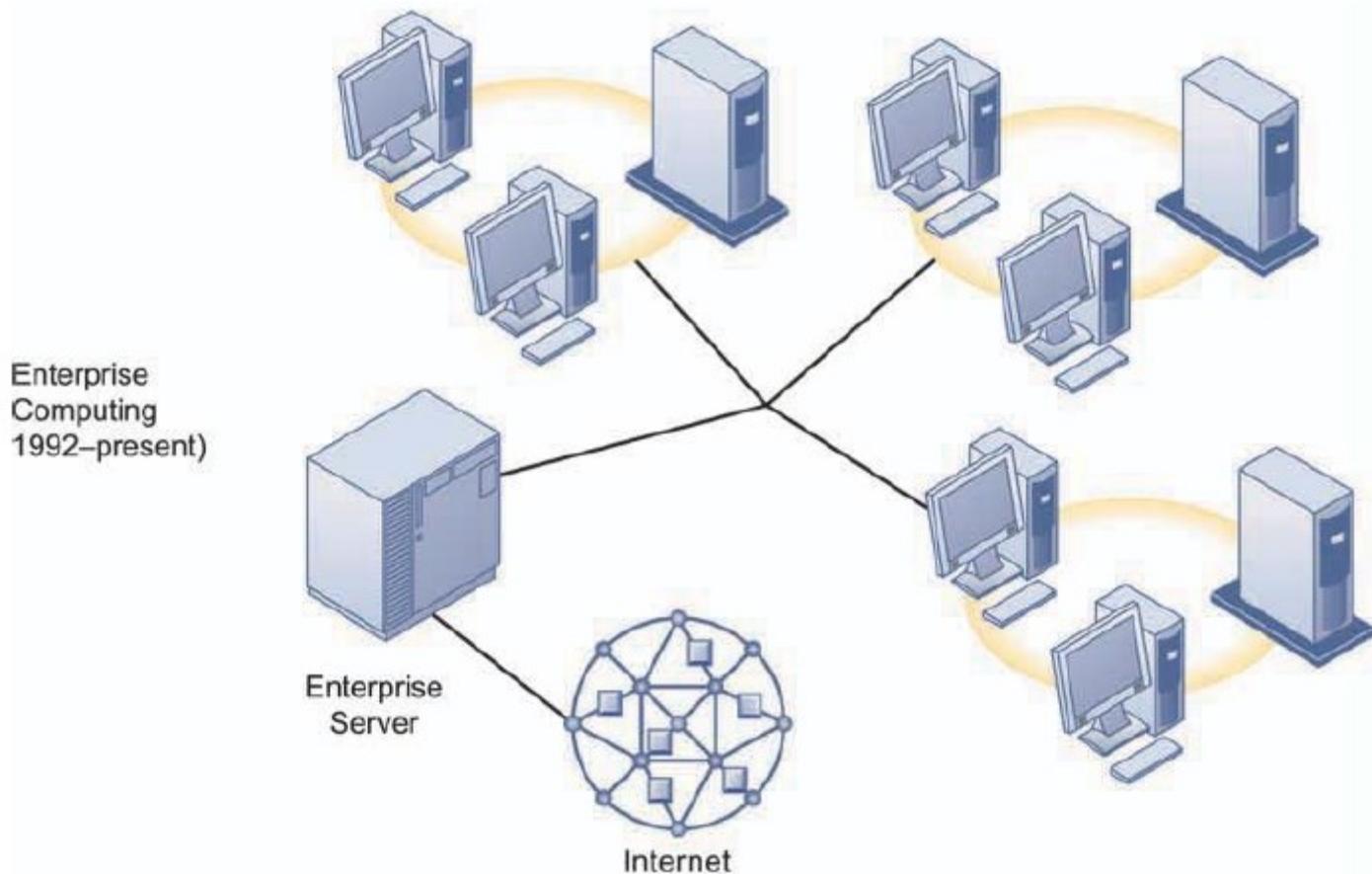
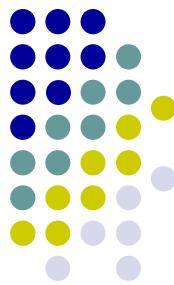
# Các giai đoạn lịch sử của hạ tầng CNTT



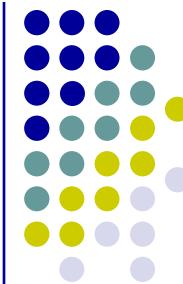
Stages in IT Infrastructure Evolution



# Các giai đoạn lịch sử của hạ tầng CNTT



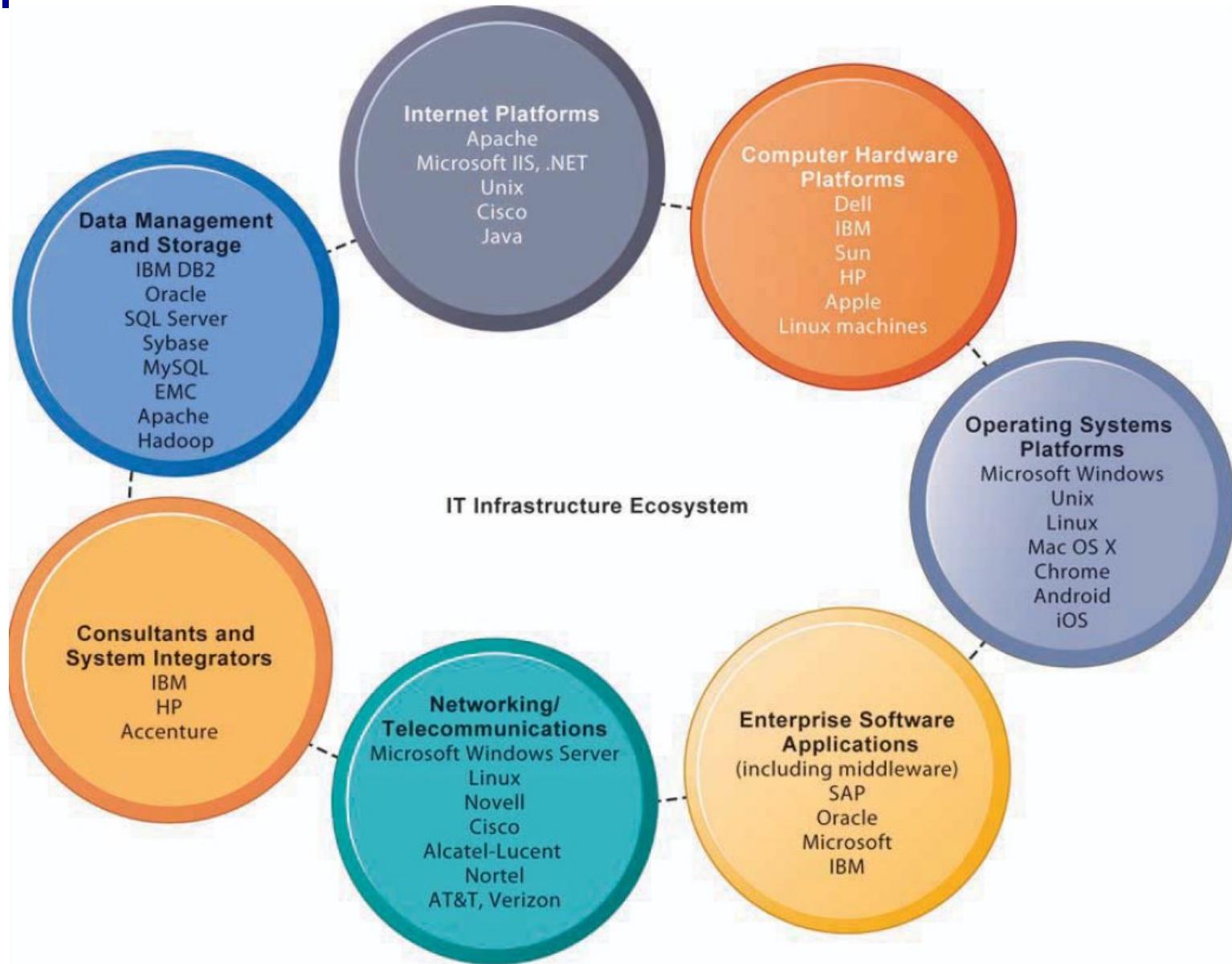
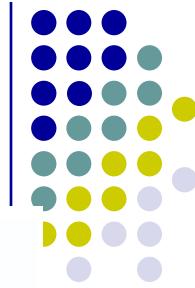
# Các giai đoạn lịch sử của hạ tầng CNTT



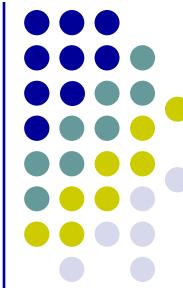
Cloud  
Computing  
(2000–present)



# Các thành phần của Hạ tầng CNTT

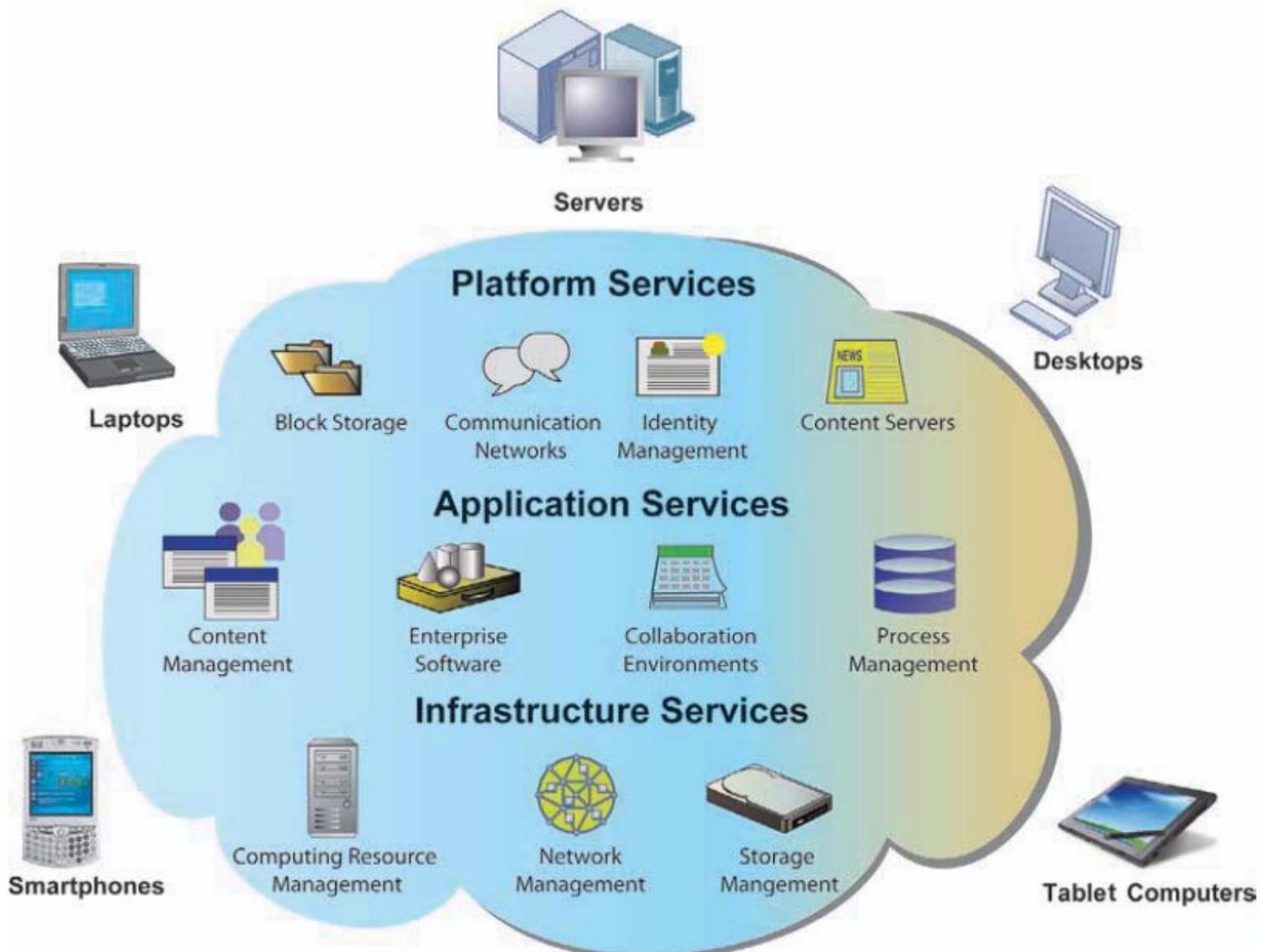
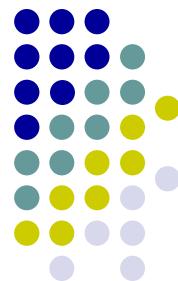


# Xu hướng phát triển phân cứng trong CNTT



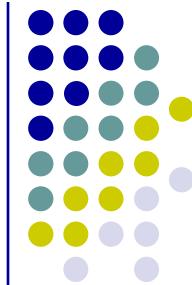
- Mobile.
- Grid Computing
- Virtualization.
- Cloud computing
- Green computing.
- High performance and power-saving processors.
- Autonomic computing (& IOT)

# Cloud Computing

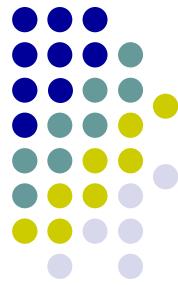


In cloud computing, hardware and software capabilities are a pool of virtualized resources provided over a network, often the Internet. Businesses and employees have access to applications and IT infrastructure anywhere, at any time, and on any device.

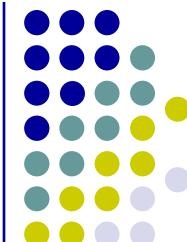
# Xu hướng phát triển phần mềm trong CNTT



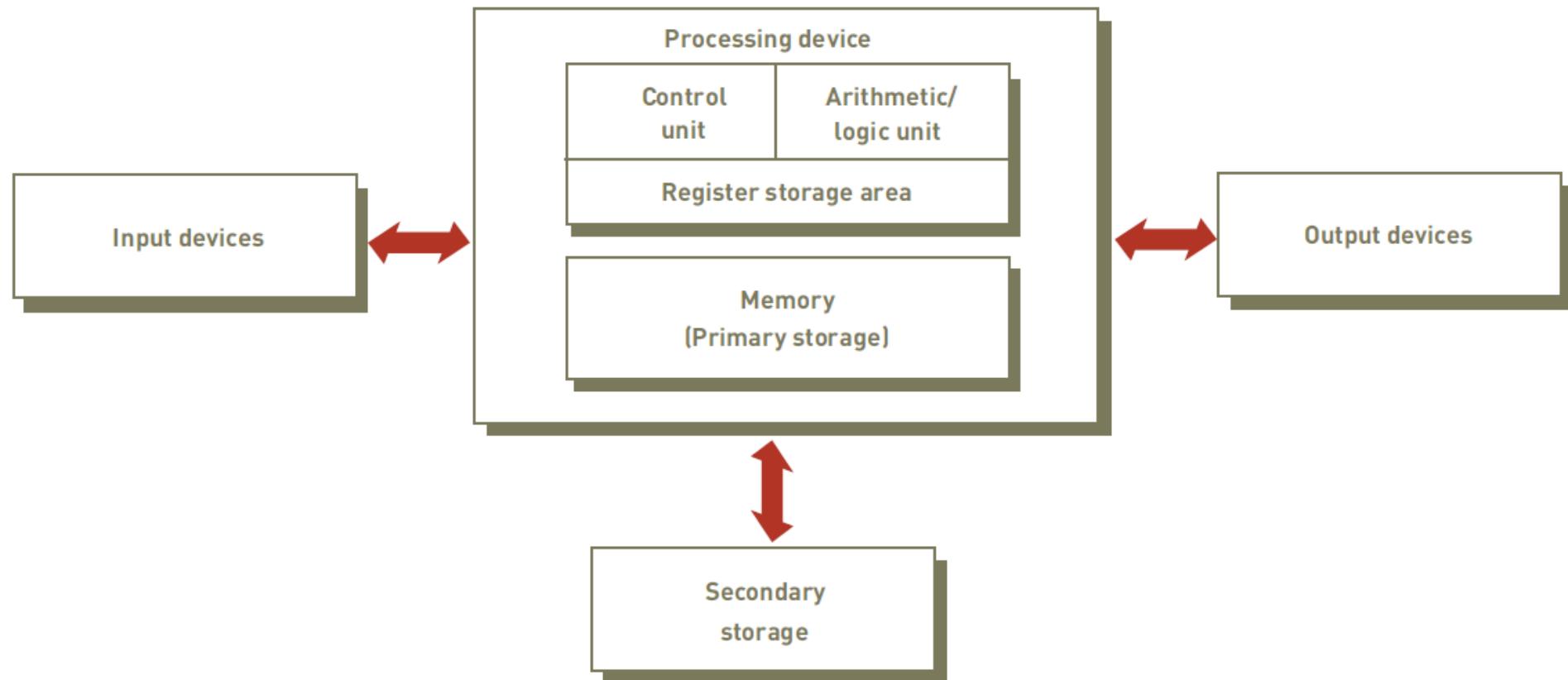
- Linux and open source software
- Java, HTML, and HTML5
- Web services and service-oriented architecture
- Software outsourcing and cloud services



# Phần cứng



# Hardware Components



# Execution of an instruction

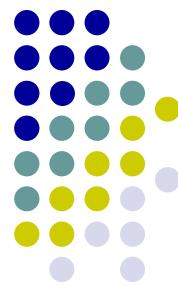
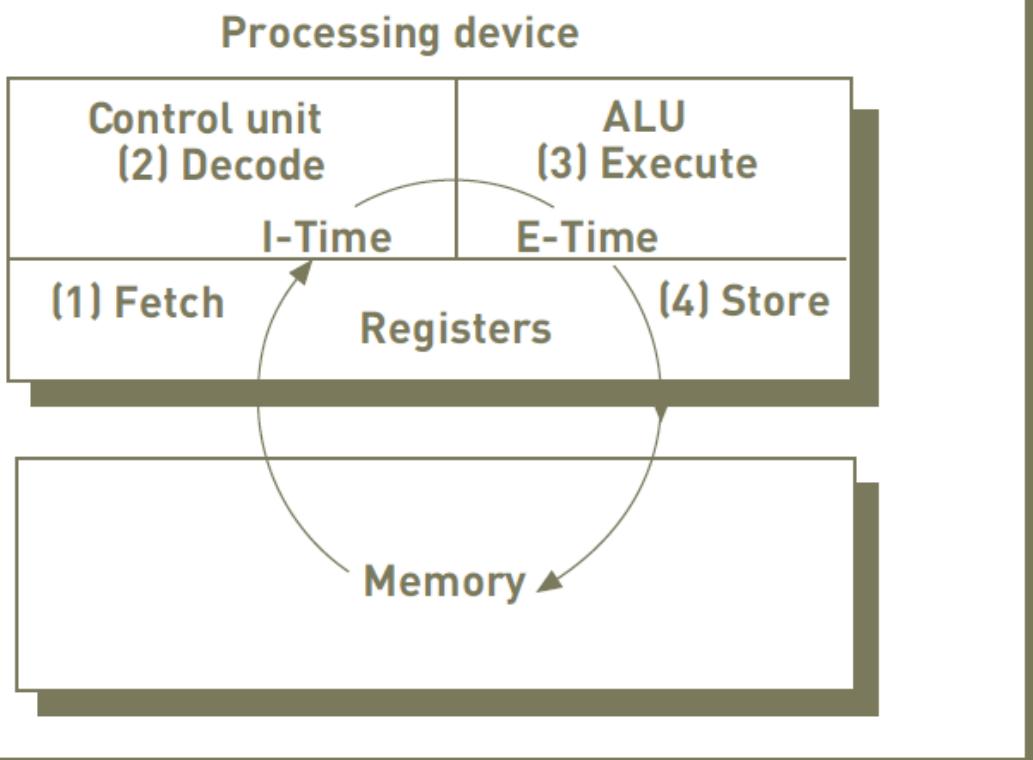


Figure 3.2



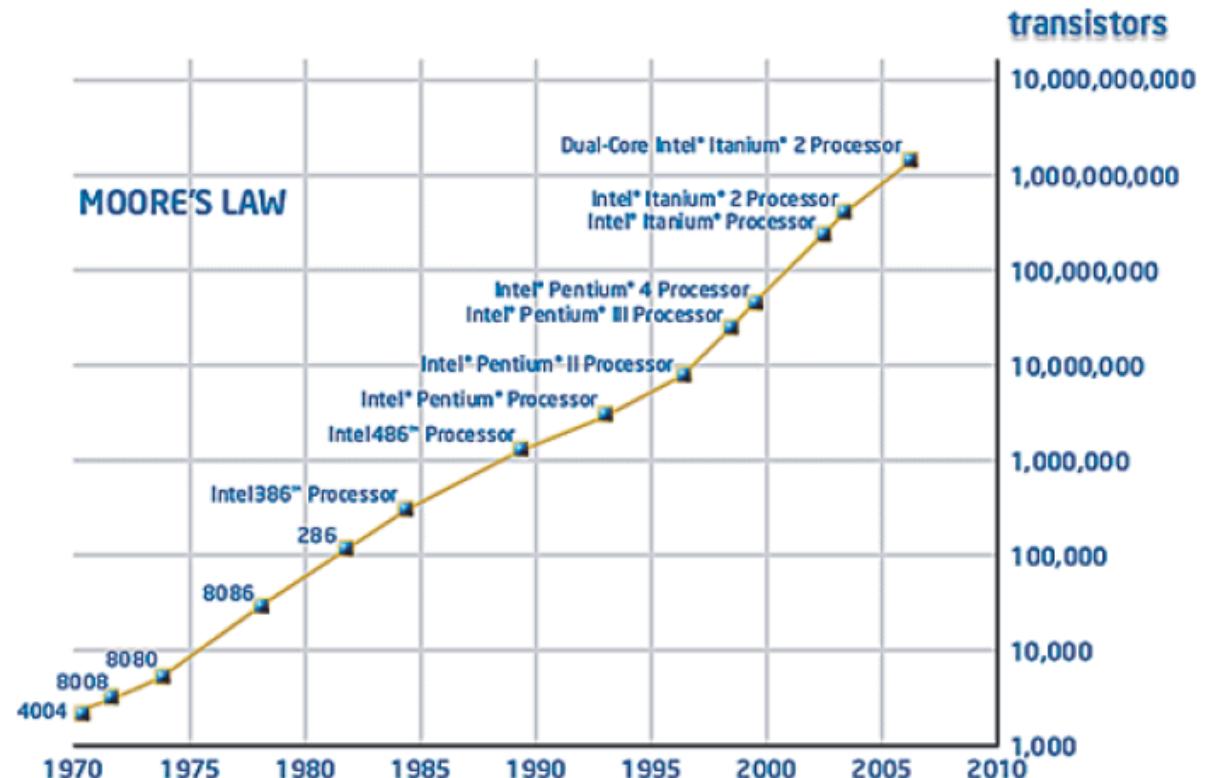
## Execution of an Instruction

In the instruction phase, a program's instructions and any necessary data are read into the processor (1). Then the instruction is decoded so the central processor can understand what to do (2). In the execution phase, the ALU does what it is instructed to do, making either an arithmetic computation or a logical comparison (3). Then the results are stored in the registers or in memory (4). The instruction and execution phases together make up one machine cycle.

# Physical Characteristics of CPU



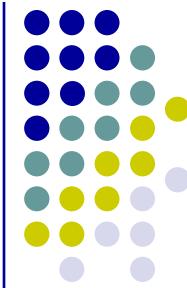
Figure 3.3



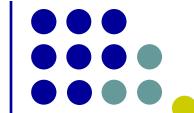
## Moore's Law

Transistor densities on a single chip double about every two years.

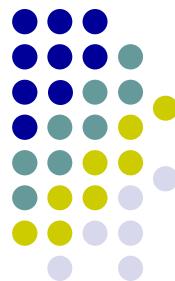
(Source: Intel Website Moore's Law: Made Real by Intel Innovation, [www.intel.com/technology/mooreslaw/?iid=search](http://www.intel.com/technology/mooreslaw/?iid=search), accessed January 9, 2008.)



Memory Type	Abbreviation	Name	Description
Volatile	RAM	Random access memory	Volatile storage devices that lose their contents if the current is turned off or disrupted.
	SRAM	Static Random Access Memory	Byte-addressable storage used for high-speed registers and caches.
	DRAM	Dynamic Random Access Memory	Byte-addressable storage used for the main memory in a computer.
	DDR SDRAM	Double Data Rate Synchronous Dynamic Random Access Memory	An improved form of DRAM.



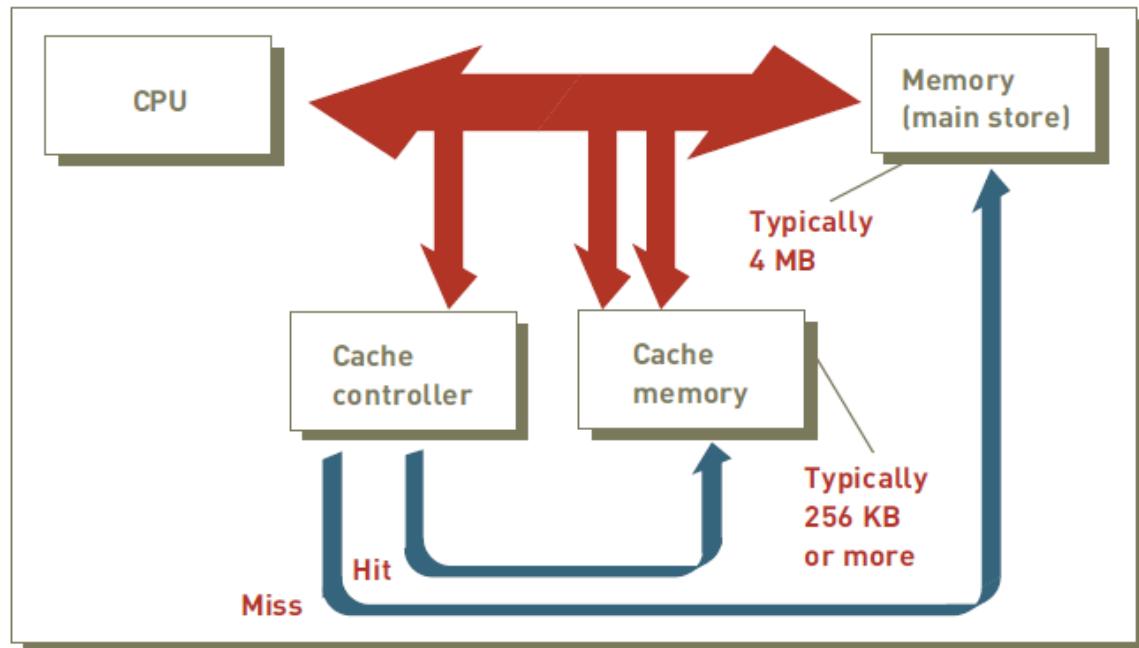
Nonvolatile	ROM	Read-only memory	Nonvolatile storage devices that do not lose their contents if the current is turned off or disrupted.
	PROM	Programmable read-only memory	Memory used to hold data and instructions that can never be changed. PROMs are programmed in an external device like EPROMs.
	EPROM	Erasable programmable read-only memory	Programmable ROM that can be erased and reused. Erasure is caused by shining an intense ultraviolet light through a window that is designed into the memory chip. EPROM chips are initially written in an external programmer device and must be removed from the circuit board and placed back in the device for reprogramming.
	EEPROM	Electrically erasable programmable read-only memory	User-modifiable read-only memory that can be erased and reprogrammed repeatedly through the application of higher than normal electrical voltage.
	Flash		Used for storage modules for USB drives and digital camera memory cards. Able to erase a block of data in a flash.
	NOR Flash		Flash memory that supports 1-byte random access so that machine instructions can be fetched and executed directly from the flash chip just like computers fetch instructions from main memory.
	NAND Flash		Flash Translation Layer software enables NAND flash memory cards and USB drives to look like a regular disk drive to the operating system.
	FeRAM		Can hold data in memory even when the power is disconnected and offers the higher speed of SDRAM.
	PCM	Phase Change Memory	One of a number of new memory technologies that may eventually replace flash memory.
	MRAM	Magnetoresistive random access memory	A nonvolatile random access memory chip based on magnetic polarization that reads and writes data faster than flash memory.

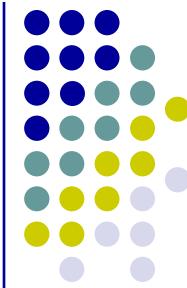


**Figure 3.4**

### Cache Memory

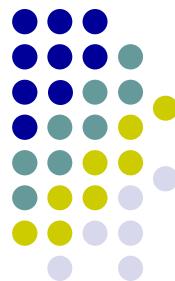
Processors can access this type of high-speed memory faster than main memory. Located on or near the CPU chip, cache memory works with main memory. A cache controller determines how often the data is used, transfers frequently used data to cache memory, and then deletes the data when it goes out of use.





# Types of Processing

- Multi processing
- Parallel Computing



# Secondary Storages

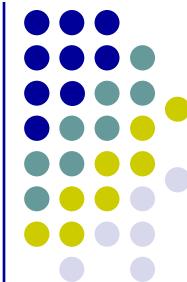
**Table 3.3**

## Cost Comparison for Various Forms of Storage

All forms of secondary storage cost considerably less per megabyte of capacity than SDRAM, although they have slower access times. A data cartridge costs about \$.21 per gigabyte, while SDRAM can cost around \$49 per gigabyte—over 200 times more expensive.

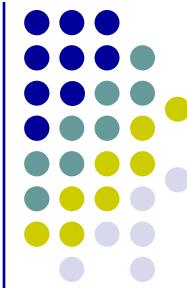
(Source: Office Depot Web site, [www.officedepot.com](http://www.officedepot.com), January 18, 2008.)

Description	Cost	Storage Capacity (GB)	Cost Per GB
72 GB DAT 72 data cartridge	\$14.95	72	\$0.21
10 - 4.7 GB DVD+R disks	\$9.95	47	\$0.21
20 GB 4 MM backup data tape	\$16.99	20	\$0.85
120 GB portable hard drive	\$139.99	120	\$1.16
25 GB Rewritable Blu-ray disk	\$29.99	25	\$1.20
9.1 GB Write Once Read Many optical disk	\$69.95	9.1	\$7.69
1 GB flash drive	\$7.99	1	\$7.99
512 MB DDR2 SDRAM memory upgrade	\$24.99	0.512	\$48.81



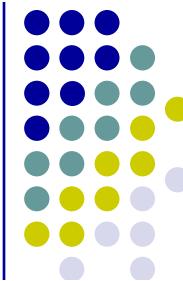
# Input Devices

- PC devices: Mouse and Keyboard
- Speech-Recognition Technology.
- Digital Cameras
- Terminals
- Scanning Devices
- Optical Data reader
- Magnetic Stripe Card
- Point of Sales Device



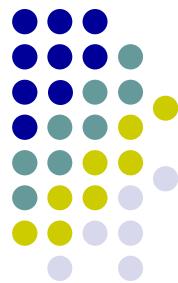
# Output Devices

- Display monitors
- Printers
- Digital Audio Player



# Computer System Types

	Single-User Systems					Multiuser System			
Factor	Handheld	Ultra Laptop	Portable	Thin Client	Desktop	Workstation	Server	Mainframe	Supercomputer
Cost Range	\$90 to \$900	\$700 to \$2250	\$500 to \$3,000	\$300 to \$900	\$400 to \$2,500	\$3,000 to \$40,000	\$500 to \$50,000	>\$100,000	>\$250,000
Weight	<24 oz.	<3 lbs.	<7 lbs.	<15 lbs.	<25 lbs.	<25 lbs.	>25 lbs.	>200 lbs.	>200 lbs.
Typical Size	Palm size	Size of a notebook	Size of a notebook	Fits on desktop	Fits on desktop	Fits on desktop	Three-drawer filing cabinet	Refrigerator	Refrigerator and larger
Typical Use	Organize personal data	Improve productivity of highly mobile worker	Improve worker productivity	Enter data and access the Internet	Improve worker productivity	Perform engineering, CAD, and software development	Perform network and Internet applications	Perform computing tasks for large organizations and provide massive data storage	Run scientific applications; perform intensive number crunching
Example	HP iPAQ Pocket PC	Fujitsu Lifebook Q2010	Dell Inspiron T5450	Wyse V90LE Thin Client	Mac Pro	Sun Ultra 40 M2 workstation	Hewlett-Packard HP ProLiant BL	Unisys Clear Path	IBM RS/6000 SP

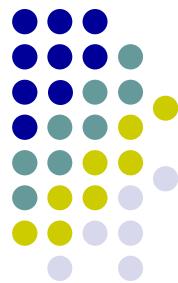


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The Dell Power Edge 1855 Chassis  
can hold up to ten blade servers.  
(Source: Courtesy of Dell Inc.)

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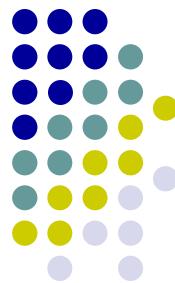
Mainframe computers have been the workhorses of corporate computing for more than 50 years. They can support hundreds of users simultaneously and handle all of the core functions of a corporation.

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(Source: Courtesy of IBM Corporation.)

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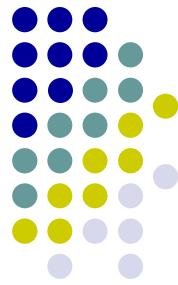


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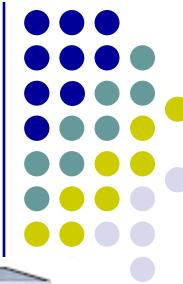
IBM's Blue Gene/L System at the Lawrence Livermore National Laboratory is the fastest supercomputer in the world and can perform 596 trillion floating-point operations per second.

(Source: Courtesy of IBM Corporation.)

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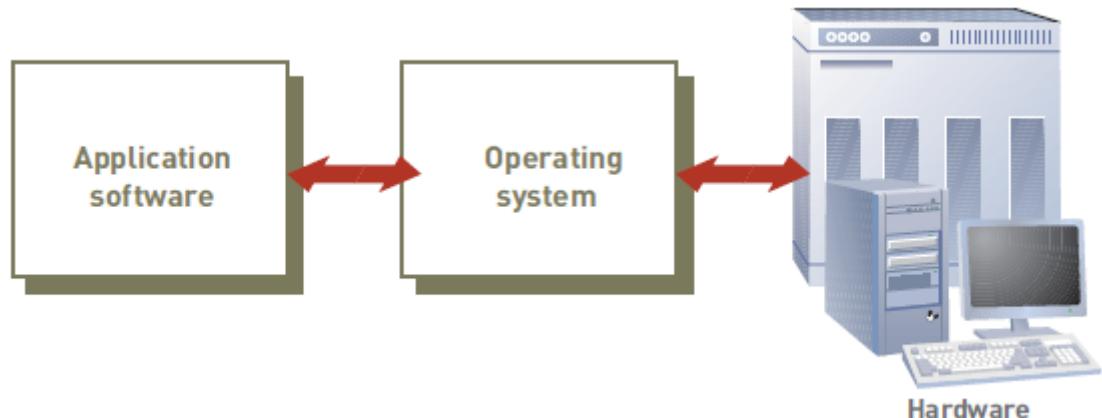


# Phần mềm



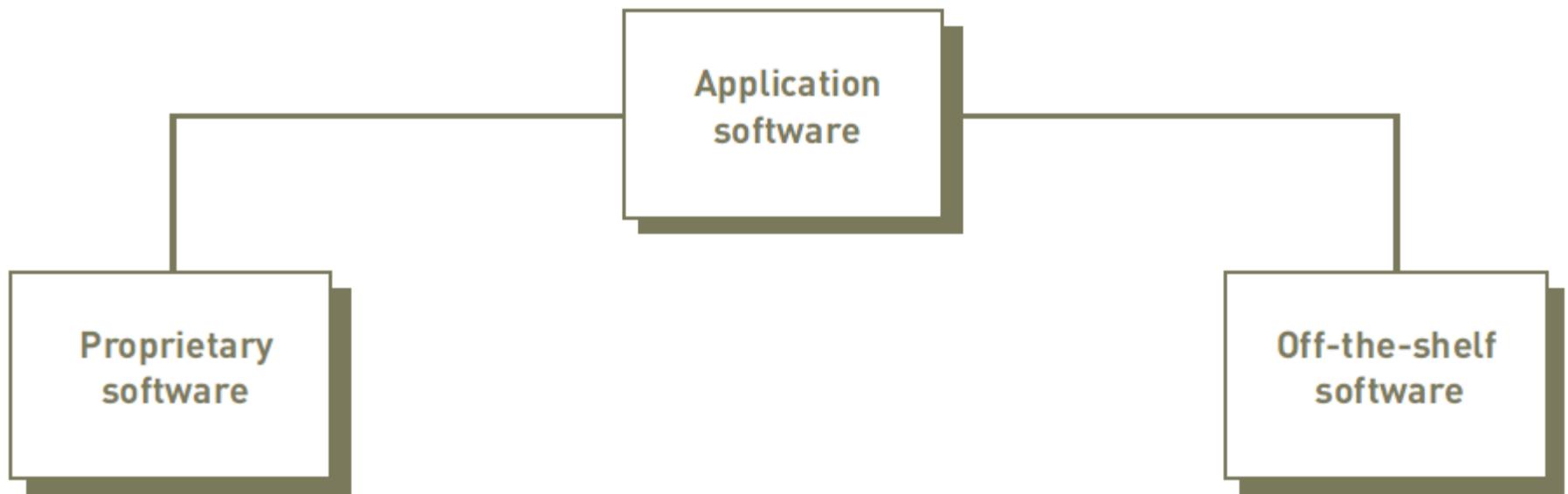
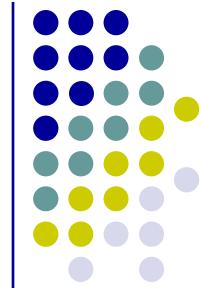
# Phần mềm hệ thống

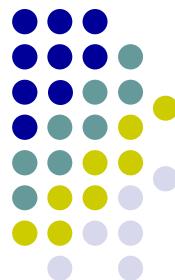
- Hệ điều hành



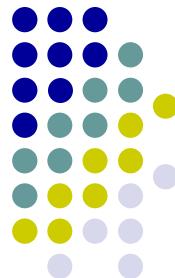
- Middleware
- Chương trình tiện ích
  - Hardware Utilities
  - Security Utilities
  - File-compression, Network and Internet

# Phần mềm ứng dụng





Proprietary Software	
Advantages	Disadvantages
You can get exactly what you need in terms of features, reports, and so on.	It can take a long time and significant resources to develop required features.
Being involved in the development offers control over the results.	In-house system development staff may become hard pressed to provide the required level of ongoing support and maintenance because of pressure to move on to other new projects.
You can modify features that you might need to counteract an initiative by competitors or to meet new supplier or customer demands. A merger with or acquisition of another firm also requires software changes to meet new business needs.	The features and performance of software that has yet to be developed presents more potential risk.



Off-the-Shelf Software	
Advantages	Disadvantages
The initial cost is lower because the software firm can spread the development costs over many customers.	An organization might have to pay for features that are not required and never used.
The software is likely to meet the basic business needs—you can analyze existing features and the performance of the package before purchasing.	The software might lack important features, thus requiring future modification or customization. This can be very expensive because users must adopt future releases of the software as well.
The package is likely to be of high quality because many customer firms have tested the software and helped identify its bugs.	The software might not match current work processes and data standards.

Type of Software	Explanation	Example	Vendor
Word processing	Create, edit, and print text documents.	Word WordPerfect Google Docs Pages Writer	Microsoft Corel Google Apple Sun
Spreadsheet	Provide a wide range of built-in functions for statistical, financial, logical, database, graphics, and date and time calculations	Excel Lotus 1-2-3 Spreadsheet Numbers Calc	Microsoft Lotus/IBM Google Apple Sun
Database	Store, manipulate, and retrieve data	Access Approach dBASE Base	Microsoft Lotus/IBM Borland Sun
Graphics	Develop graphs, illustrations, and drawings	Illustrator FreeHand	Adobe Macromedia
Project management	Plan, schedule, allocate, and control people and resources (money, time, and technology) needed to complete a project according to schedule	Project for Windows On Target Project Schedule Time Line	Microsoft Symantec Scitor Symantec
Financial management	Provide income and expense tracking and reporting to monitor and plan budgets (some programs have investment portfolio management features)	Quicken Money	Intuit Microsoft
Desktop publishing (DTP)	Use with personal computers and high-resolution printers to create high-quality printed output, including text and graphics; various styles of pages can be laid out; art and text files from other	QuarkXPress Publisher PageMaker Ventura Publisher Pages	Quark Microsoft Adobe Corel Apple

# Personal Productivity Apps



Figure 4.13

## Word Processing Program

Word processing applications can be used to write letters, professional documents, work reports, and term papers.

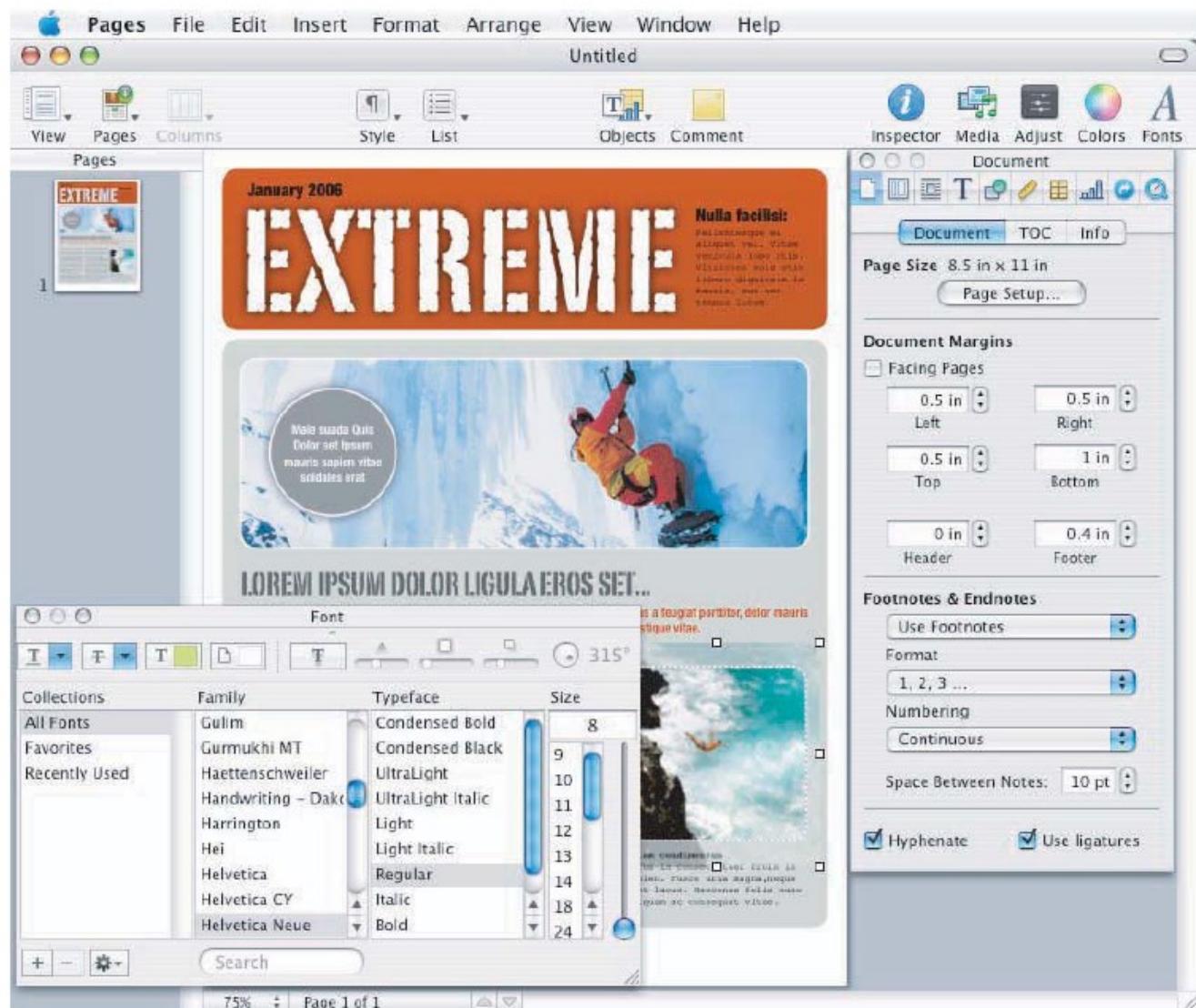
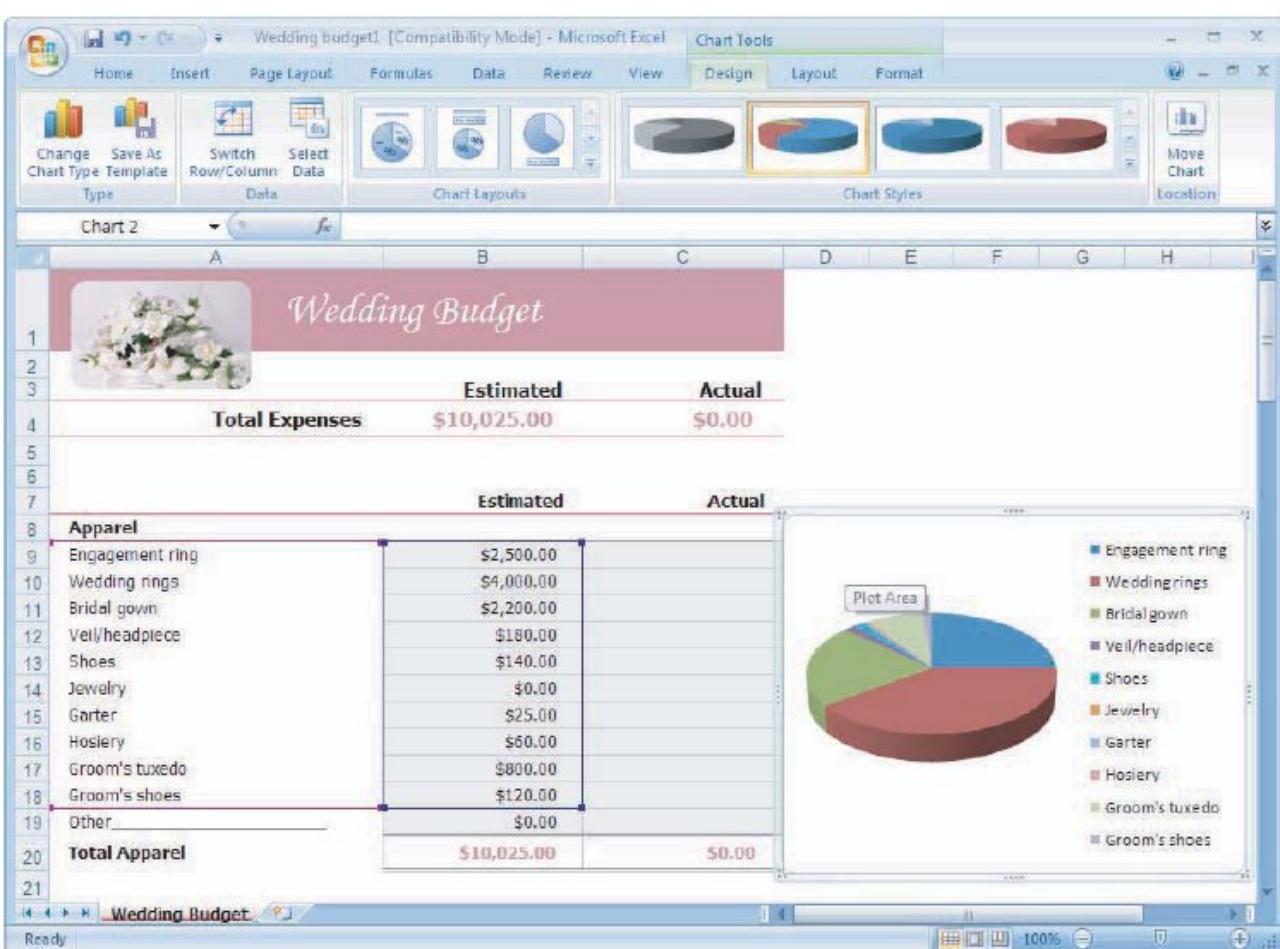


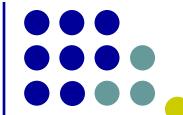


Figure 4.14

## Spreadsheet Program

Spreadsheet programs should be considered when calculations are required.





**Figure 4.15**

## Database Program

After being entered into a database application, information can be manipulated and used to produce reports and documents.

Northwind 2007 : Database (Access 2007) - Microsoft Access

Home Create External Data Database Tools

Views Paste Clipboard

Font Rich Text

Records Sort & Filter

Filter Find

Find

Northwind Trad... <> Home Customer List Top Ten Orders by Sales Amount

Customers & Ord... < >

- Top Ten Orders b...
- Customer Details
- Customer List
- Order Details
- Order List

Inventory & Purc... < >

- Suppliers
- Shippers
- Reports
- Employees
- Supporting Objects

Order ID	SaleAmount	Order Date	CompanyName	Shipped Date
41	\$13,800.00	3/24/2006	Company G	
38	\$13,800.00	3/10/2006	Company BB	3/11/2006
47	\$4,200.00	4/8/2006	Company F	4/8/2006
46	\$3,690.00	4/5/2006	Company I	4/5/2006
58	\$3,520.00	4/22/2006	Company D	4/22/2006
79	\$2,490.00	6/23/2006	Company F	6/23/2006
77	\$2,250.00	6/5/2006	Company Z	6/5/2006
36	\$1,930.00	2/23/2006	Company C	2/25/2006
44	\$1,674.75	3/24/2006	Company A	
78	\$1,560.00	6/5/2006	Company CC	6/5/2006

Record: 1 of 10 No Filter Search

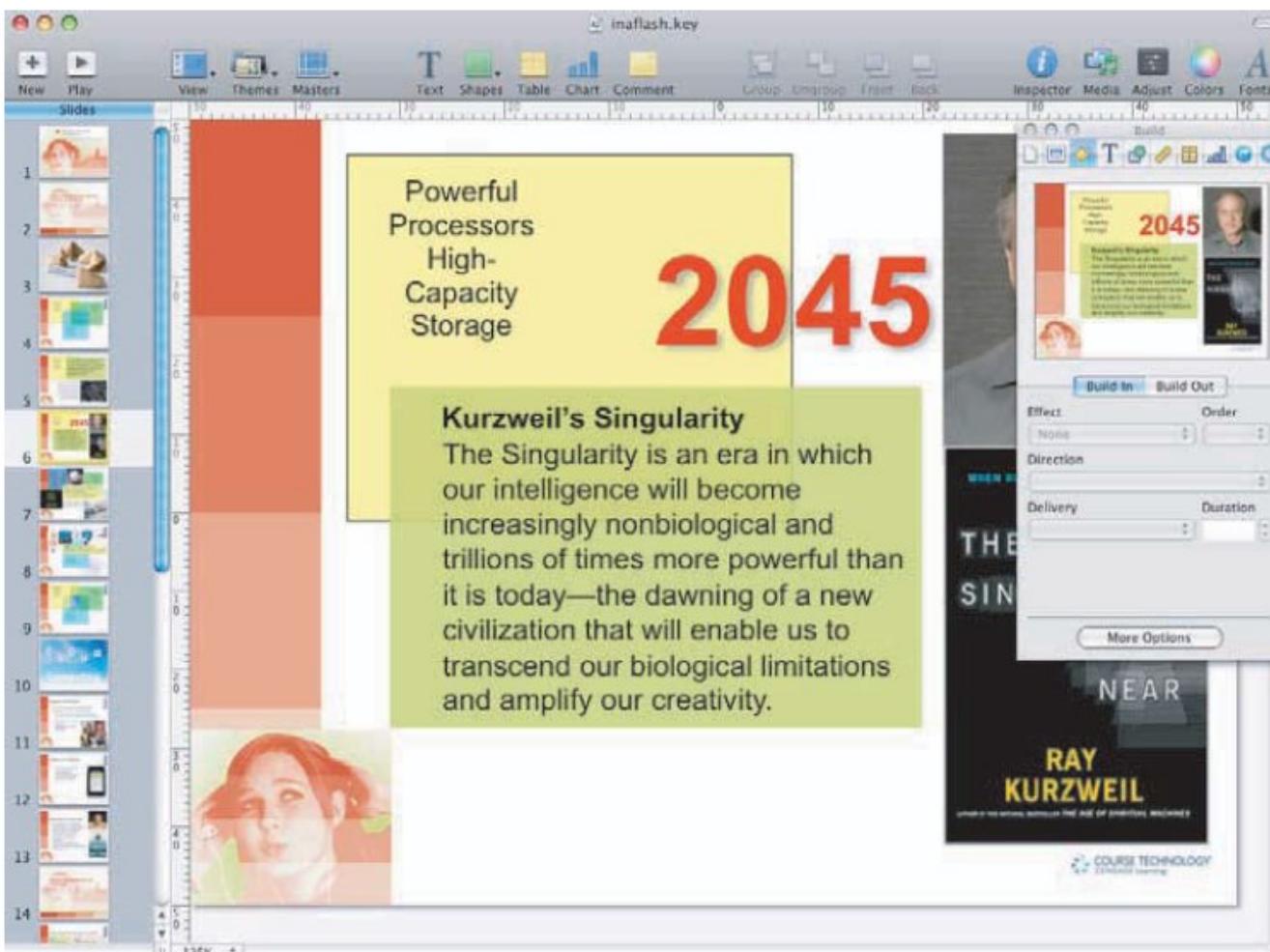
Datasheet View Num Lock SQL

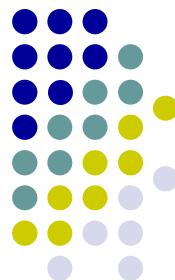


Figure 4.16

## Presentation Graphics Program

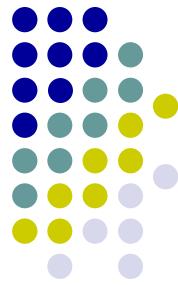
Graphics programs can help you make a presentation at school or work.





# Enterprise App Software

Type of Software	Description
Accounts receivable	Sales ordering
Accounts payable	Order entry
Airline industry operations	Payroll
Automatic teller systems	Human resource management
Cash-flow analysis	Check processing
Credit and charge card administration	Tax planning and preparation
Manufacturing control	Receiving
Distribution control	Restaurant management
General ledger	Retail operations
Stock and bond management	Invoicing
Savings and time deposits	Shipping
Inventory control	Fixed asset accounting



# Hệ quản trị CSDL

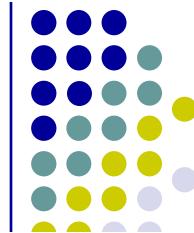
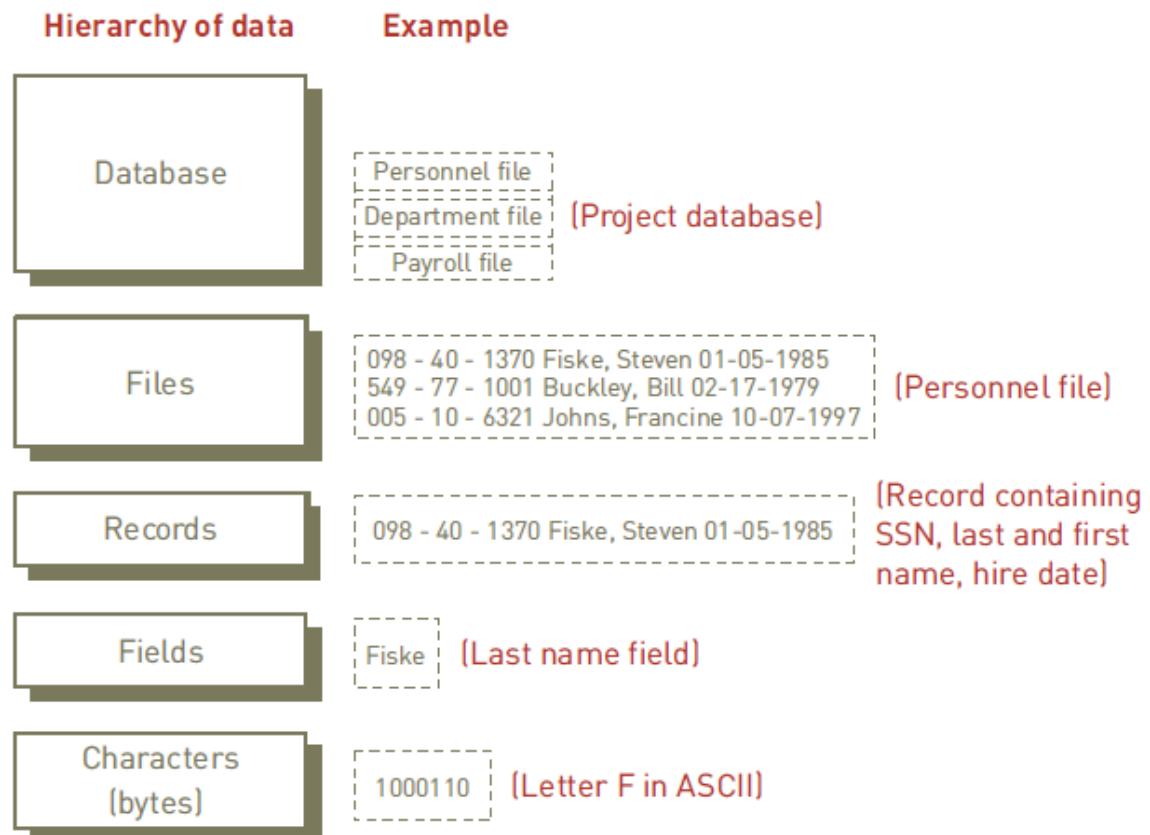
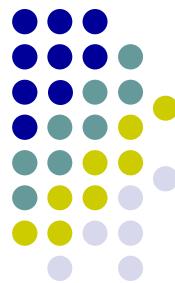


Figure 5.1

## The Hierarchy of Data



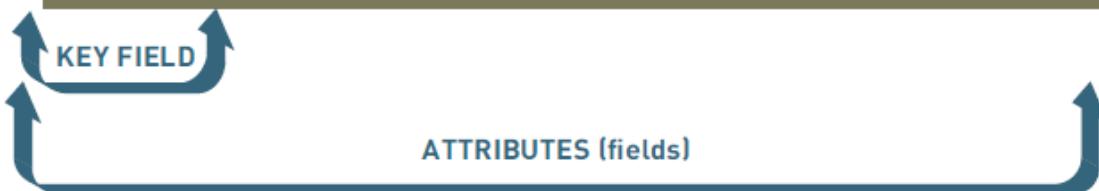


**Figure 5.2**

### Keys and Attributes

The key field is the employee number. The attributes include last name, first name, hire date, and department number.

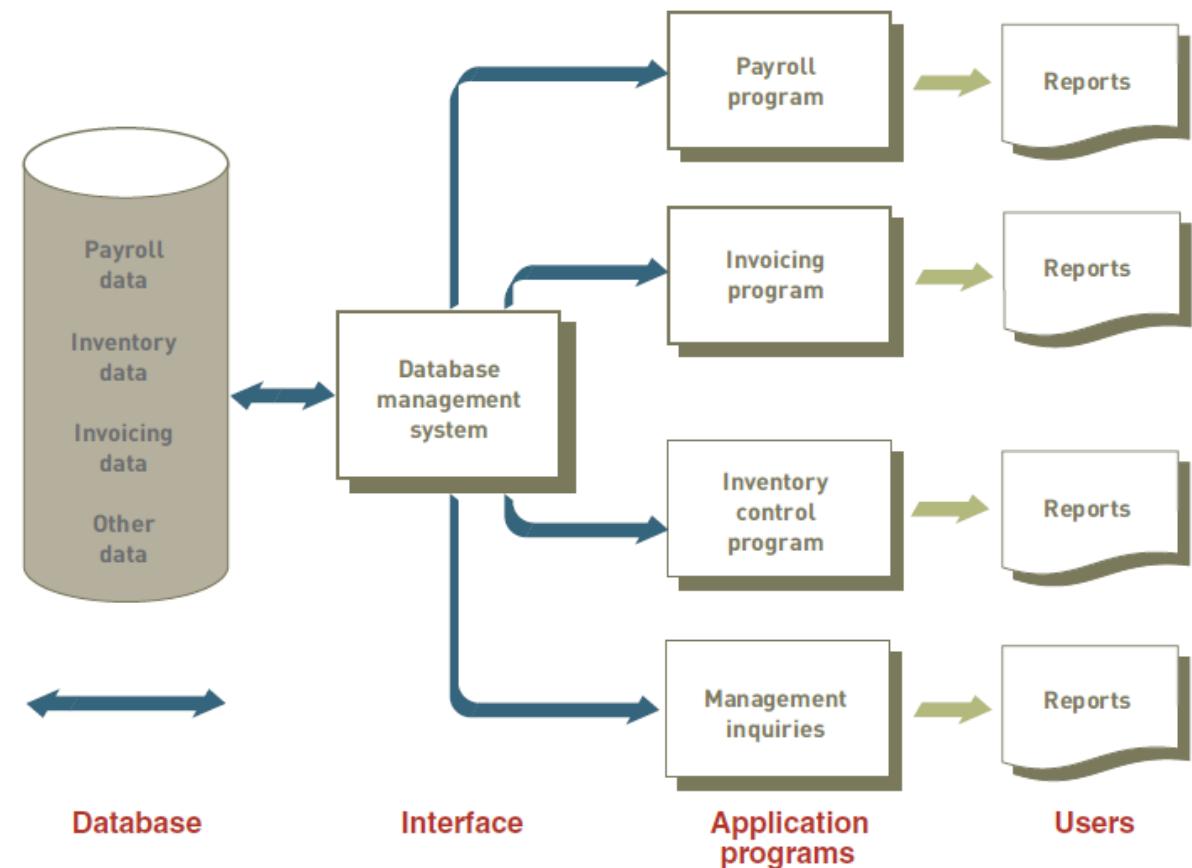
Employee #	Last name	First name	Hire date	Dept. number
005-10-6321	Johns	Francine	10-07-1997	257
549-77-1001	Buckley	Bill	02-17-1979	632
098-40-1370	Fiske	Steven	01-05-1985	598



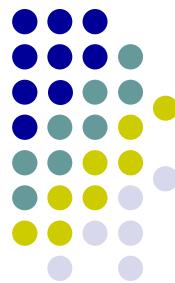


**Figure 5.3**

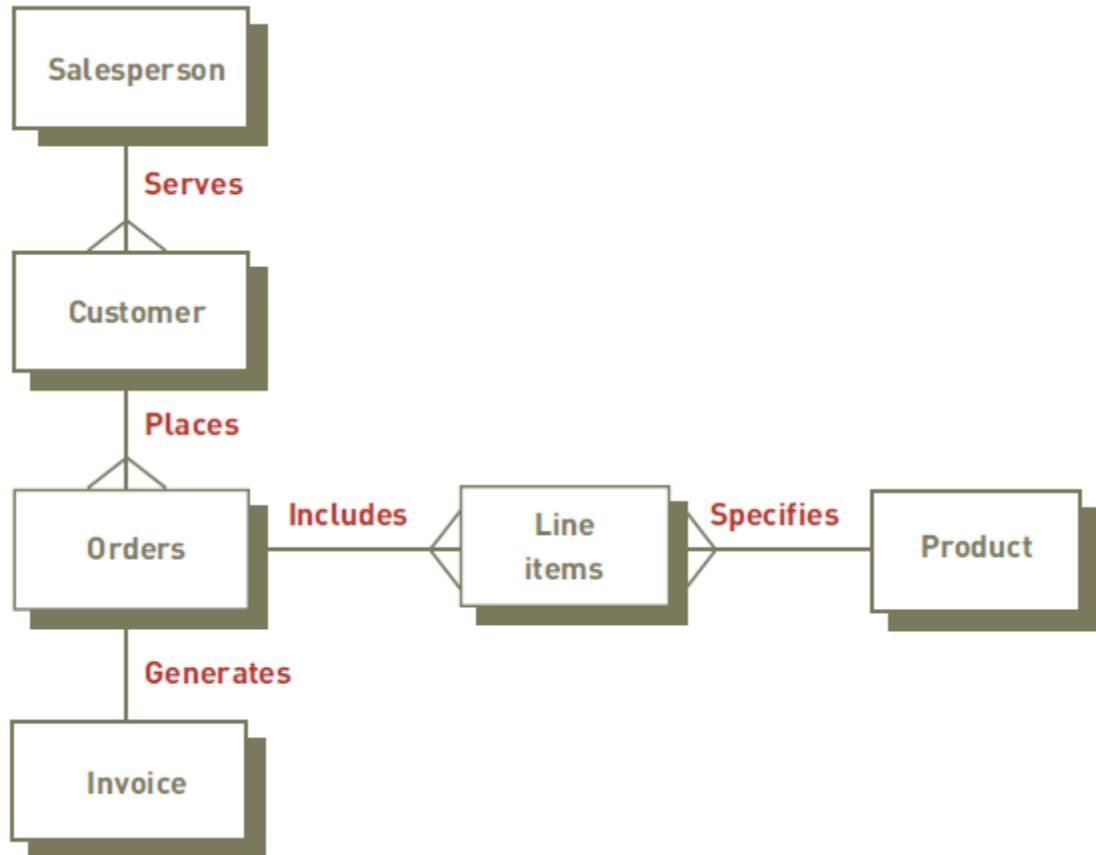
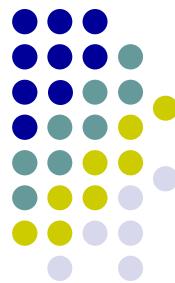
The Database Approach to Data Management



Advantages	Explanation
Improved strategic use of corporate data	Accurate, complete, up-to-date data can be made available to decision makers where, when, and in the form they need it. The database approach can also give greater visibility to the organization's data resource.
Reduced data redundancy	Data is organized by the DBMS and stored in only one location. This results in more efficient use of system storage space.
Improved data integrity	With the traditional approach, some changes to data were not reflected in all copies of the data kept in separate files. The database approach prevents this problem because no separate files contain copies of the same piece of data.
Easier modification and updating	The DBMS coordinates data modifications and updates. Programmers and users do not have to know where the data is physically stored. Data is stored and modified once. Modification and updating is also easier because the data is commonly stored in only one location.
Data and program independence	The DBMS organizes the data independently of the application program, so the application program is not affected by the location or type of data. Introduction of new data types not relevant to a particular application does not require rewriting that application to maintain compatibility with the data file.
Better access to data and information	Most DBMSs have software that makes it easy to access and retrieve data from a database. In most cases, users give simple commands to get important information. Relationships between records can be more easily investigated and exploited, and applications can be more easily combined.
Standardization of data access	A standardized, uniform approach to database access means that all application programs use the same overall procedures to retrieve data and information.
A framework for program development	Standardized database access procedures can mean more standardization of program development. Because programs go through the DBMS to gain access to data in the database, standardized database access can provide a consistent framework for program development. In addition, each application program need address only the DBMS, not the actual data files, reducing application development time.
Better overall protection of the data	Accessing and using centrally located data is easier to monitor and control. Security codes and passwords can ensure that only authorized people have access to particular data and information in the database, thus ensuring privacy.
Shared data and information resources	The cost of hardware, software, and personnel can be spread over many applications and users. This is a primary feature of a DBMS.



Disadvantages	Explanation
More complexity	DBMSs can be difficult to set up and operate. Many decisions must be made correctly for the DBMS to work effectively. In addition, users have to learn new procedures to take full advantage of a DBMS.
More difficult to recover from a failure	With the traditional approach to file management, a failure of a file affects only a single program. With a DBMS, a failure can shut down the entire database.
More expensive	DBMSs can be more expensive to purchase and operate. The expense includes the cost of the database and specialized personnel, such as a database administrator, who is needed to design and operate the database. Additional hardware might also be required.



**Figure 5.4**

An Entity-Relationship (ER)  
Diagram for a Customer Order  
Database

Development of ER diagrams helps  
ensure that the logical structure of  
application programs is consistent  
with the data relationships in the  
database.

Data Table 1: Project Table

Project	Description	Dept. number
155	Payroll	257
498	Widgets	632
226	Sales manual	598

**Figure 5.5**

### A Relational Database Model

In the relational model, all data elements are placed in two-dimensional tables, or relations. As long as they share at least one common element, these relations can be linked to output useful information. Note that some organizations might use employee number instead of Social Security number (SSN) in Data Tables 2 and 3.

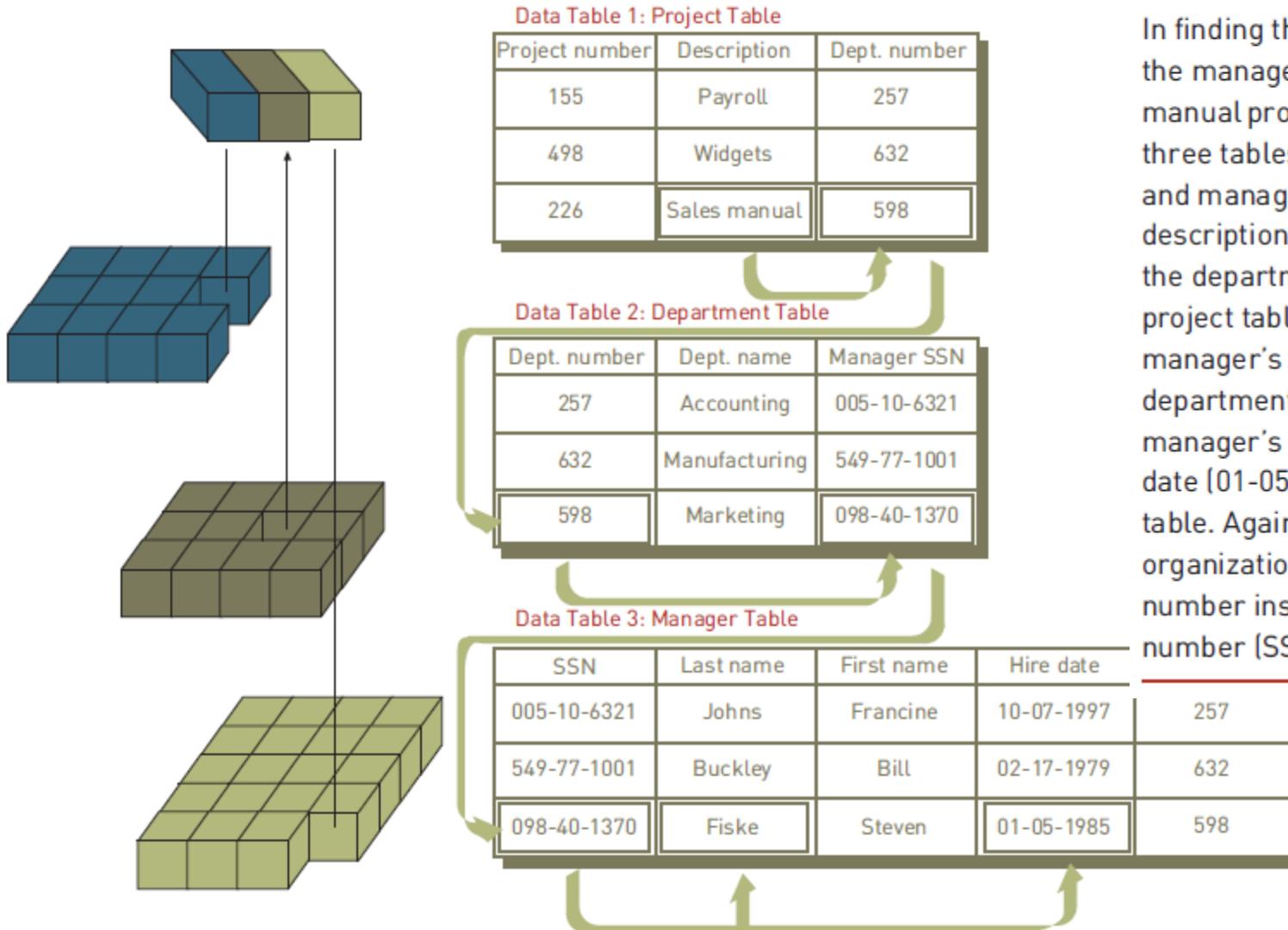
Data Table 2: Department Table

Dept.	Dept. name	Manager SSN
257	Accounting	005-10-6321
632	Manufacturing	549-77-1001
598	Marketing	098-40-1370

Data Table 3: Manager Table

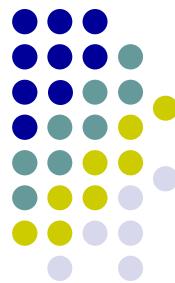
SSN	Last name	First name	Hire date	Dept. number
005-10-6321	Johns	Francine	10-07-1997	257
549-77-1001	Buckley	Bill	02-17-1979	632
098-40-1370	Fiske	Steven	01-05-1985	598

Figure 5.7



## Linking Data Tables to Answer an Inquiry

In finding the name and hire date of the manager working on the sales manual project, the president needs three tables: project, department, and manager. The project description (Sales manual) leads to the department number (598) in the project table, which leads to the manager's SSN (098-40-1370) in the department table, which leads to the manager's name (Fiske) and hire date (01-05-1985) in the manager table. Again, note that some organizations might use employee number instead of Social Security number (SSN).



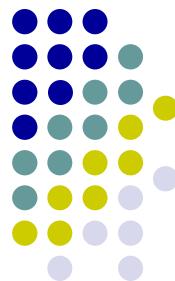
**Figure 5.16**

### Database Administrator

The role of the database administrator (DBA) is to plan, design, create, operate, secure, monitor, and maintain databases.

(Source: BananaStock / Alamy.)

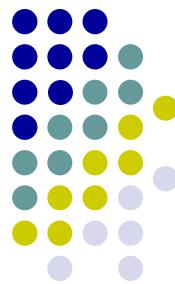




**Table 5.8**

**Common Data-Mining Applications**

Application	Description
Branding and positioning of products and services	Enable the strategist to visualize the different positions of competitors in a given market using performance (or other) data on dozens of key features of the product and then to condense all that data into a perceptual map of only two or three dimensions.
Customer churn	Predict current customers who are likely to switch to a competitor.
Direct marketing	Identify prospects most likely to respond to a direct marketing campaign (such as a direct mailing).
Fraud detection	Highlight transactions most likely to be deceptive or illegal.
Market basket analysis	Identify products and services that are most commonly purchased at the same time (e.g., nail polish and lipstick).
Market segmentation	Group customers based on who they are or on what they prefer.
Trend analysis	Analyze how key variables (e.g., sales, spending, promotions) vary over time.



# Business Intelligence

## business intelligence

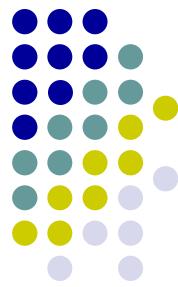
The process of gathering enough of the right information in a timely manner and usable form and analyzing it to have a positive impact on business strategy, tactics, or operations.

## competitive intelligence

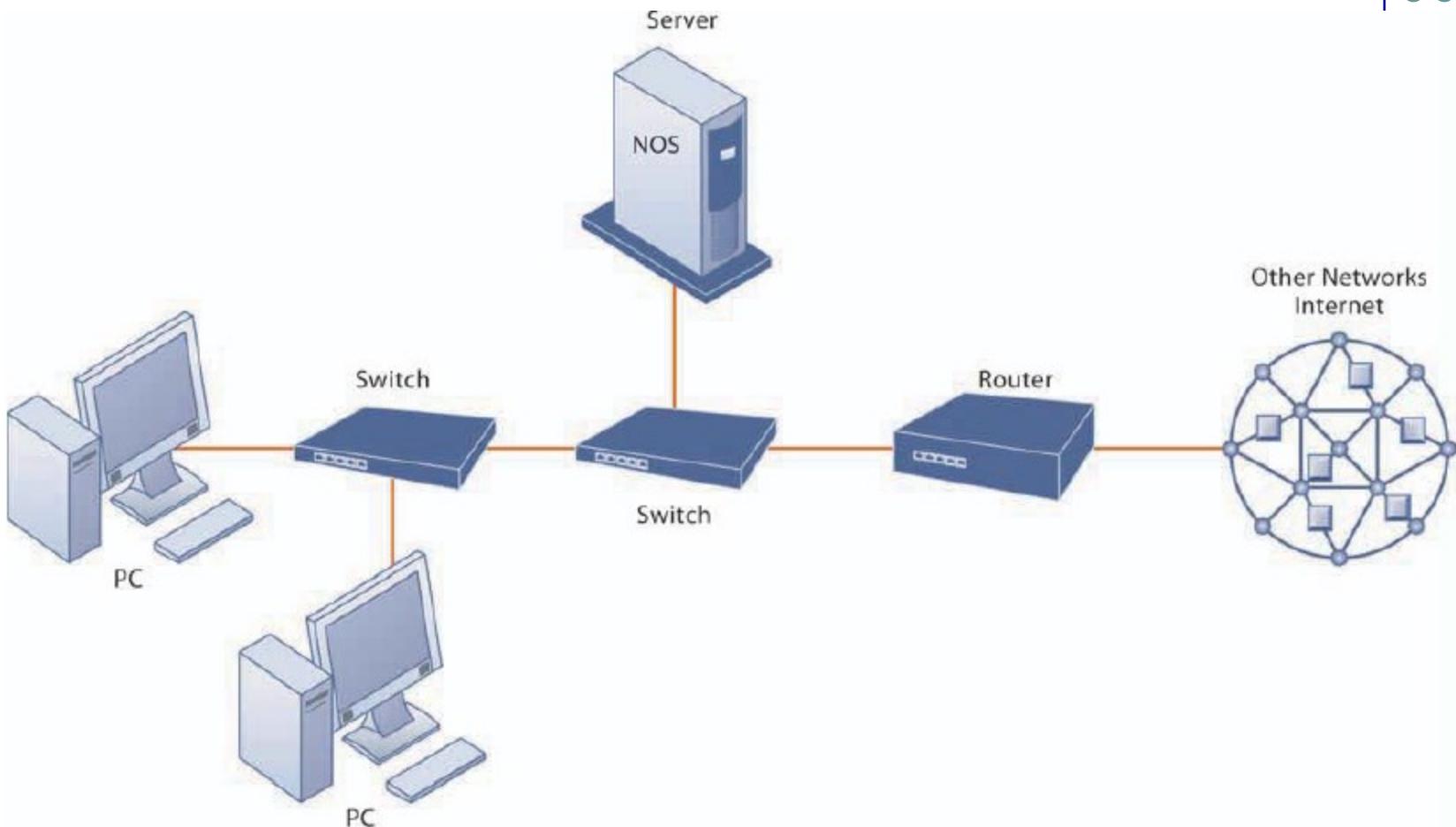
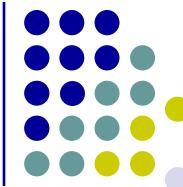
One aspect of business intelligence limited to information about competitors and the ways that knowledge affects strategy, tactics, and operations.

## counterintelligence

The steps an organization takes to protect information sought by “hostile” intelligence gatherers.

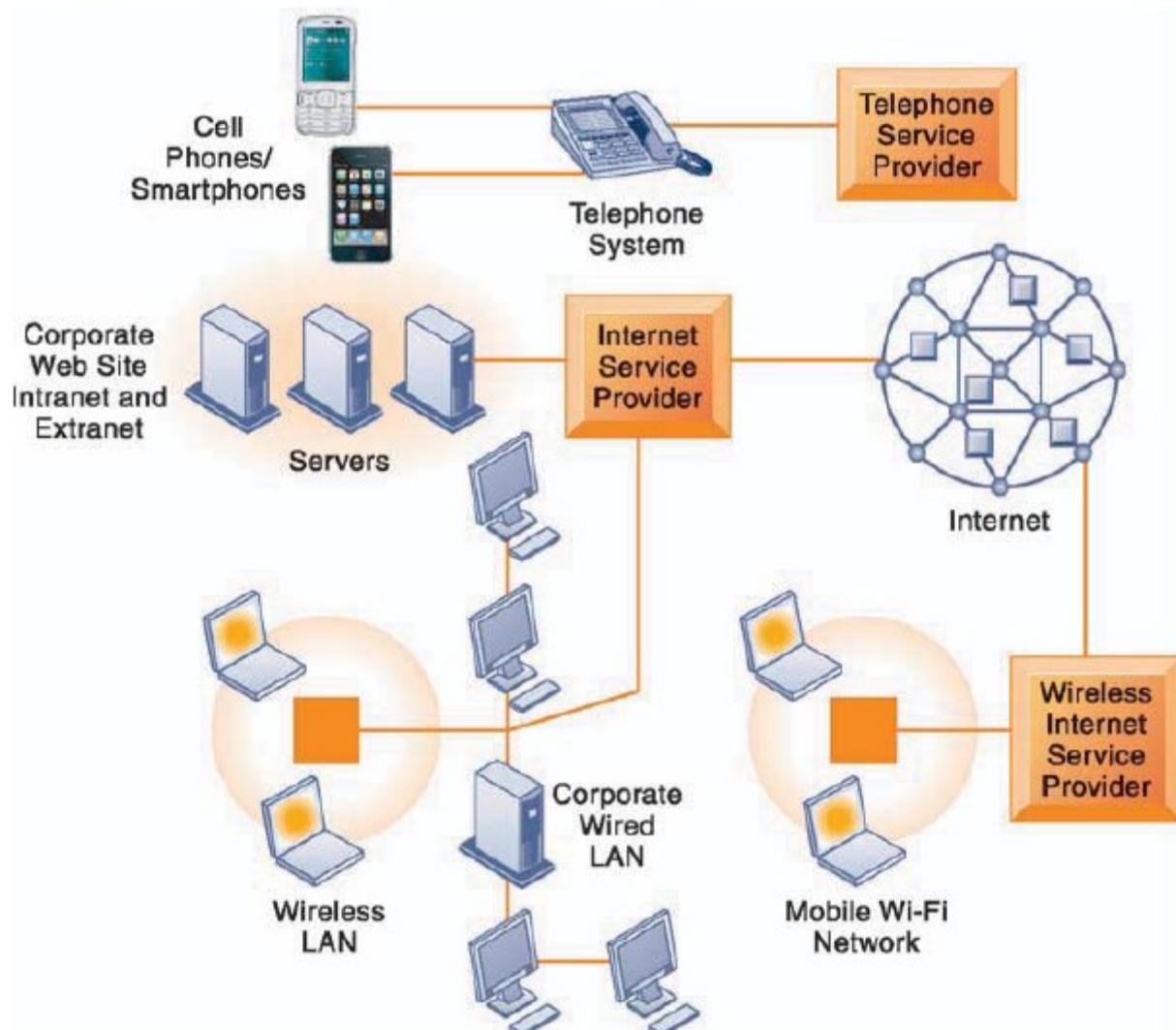


# Mạng máy tính



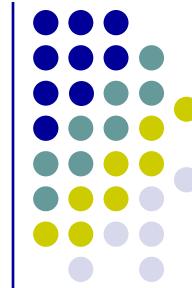
Illustrated here is a very simple computer network, consisting of computers, a network operating system (NOS) residing on a dedicated server computer, cable (wiring) connecting the devices, switches, and a router.

## FIGURE 7.2 CORPORATE NETWORK INFRASTRUCTURE

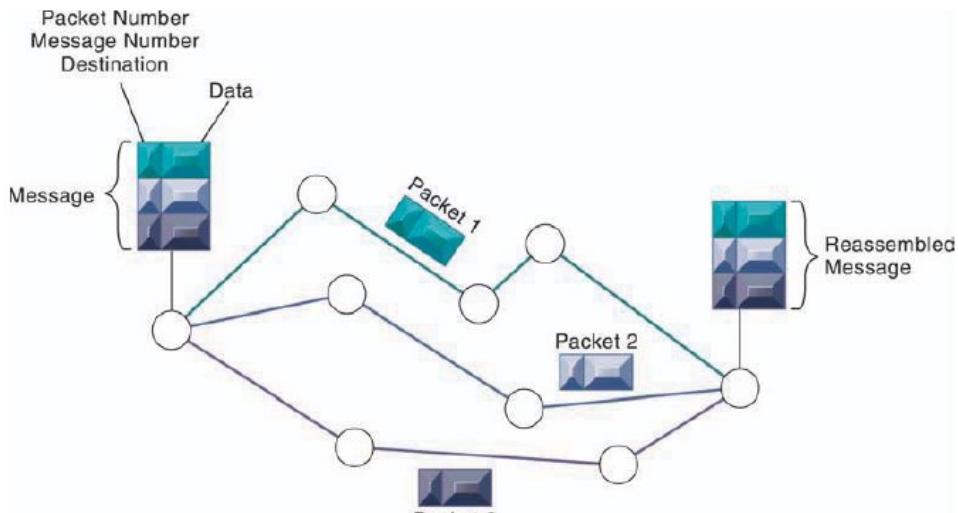


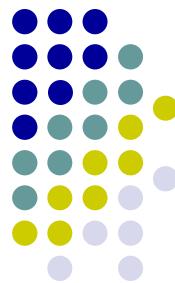
Today's corporate network infrastructure is a collection of many different networks from the public switched telephone network, to the Internet, to corporate local area networks linking workgroups, departments, or office floors.

# Key Digital Network Techs



- Client/Server Computing.
- Packet Switching.
- TCI/IP connectivity

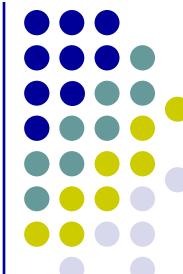




# Communications Networks

**TABLE 7.1 TYPES OF NETWORKS**

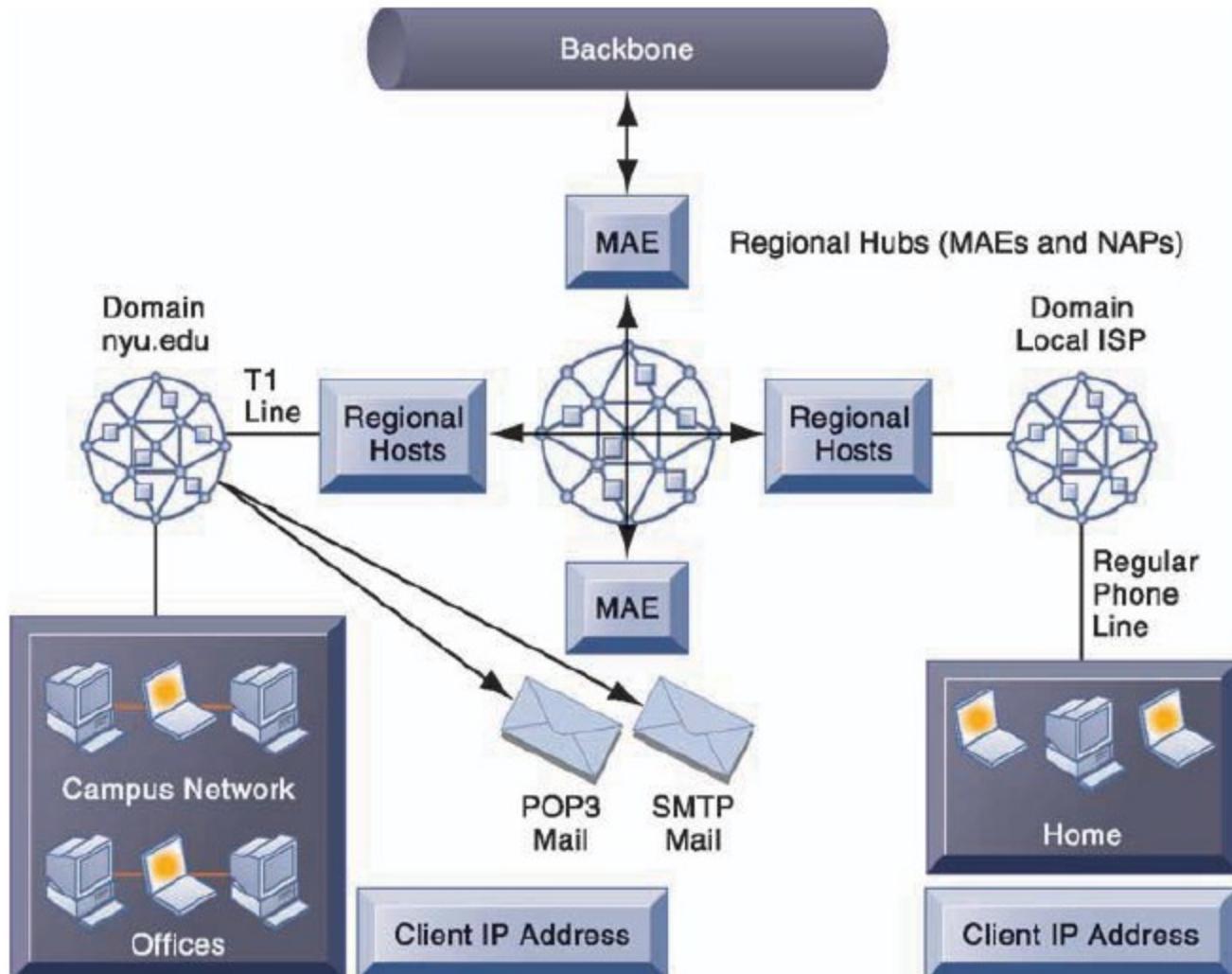
TYPE	AREA
Local area network (LAN)	Up to 500 meters (half a mile); an office or floor of a building
Campus area network (CAN)	Up to 1,000 meters (a mile); a college campus or corporate facility
Metropolitan area network (MAN)	A city or metropolitan area
Wide area network (WAN)	A transcontinental or global area



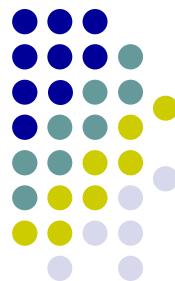
**TABLE 7.2 PHYSICAL TRANSMISSION MEDIA**

TRANSMISSION MEDIUM	DESCRIPTION	SPEED
Twisted pair wire (CAT 5)	Strands of copper wire twisted in pairs for voice and data communications. CAT 5 is the most common 10 Mbps LAN cable. Maximum recommended run of 100 meters.	10 Mbps to 1 Gbps
Coaxial cable	Thickly insulated copper wire, which is capable of high-speed data transmission and less subject to interference than twisted wire. Currently used for cable TV and for networks with longer runs (more than 100 meters).	Up to 1 Gbps
Fiber optic cable	Strands of clear glass fiber, transmitting data as pulses of light generated by lasers. Useful for high-speed transmission of large quantities of data. More expensive than other physical transmission media and harder to install; often used for network backbone.	500 Kbps to 6+Tbps
Wireless transmission media	Based on radio signals of various frequencies and includes both terrestrial and satellite microwave systems and cellular networks. Used for long-distance, wireless communication and Internet access.	Up to 600+ Mbps

**FIGURE 7.7 INTERNET NETWORK ARCHITECTURE**

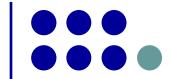


The Internet backbone connects to regional networks, which in turn provide access to Internet service providers, large firms, and government institutions. Network access points (NAPs) and metropolitan area exchanges (MAEs) are hubs where the backbone intersects regional and local networks and where backbone owners connect with one another.

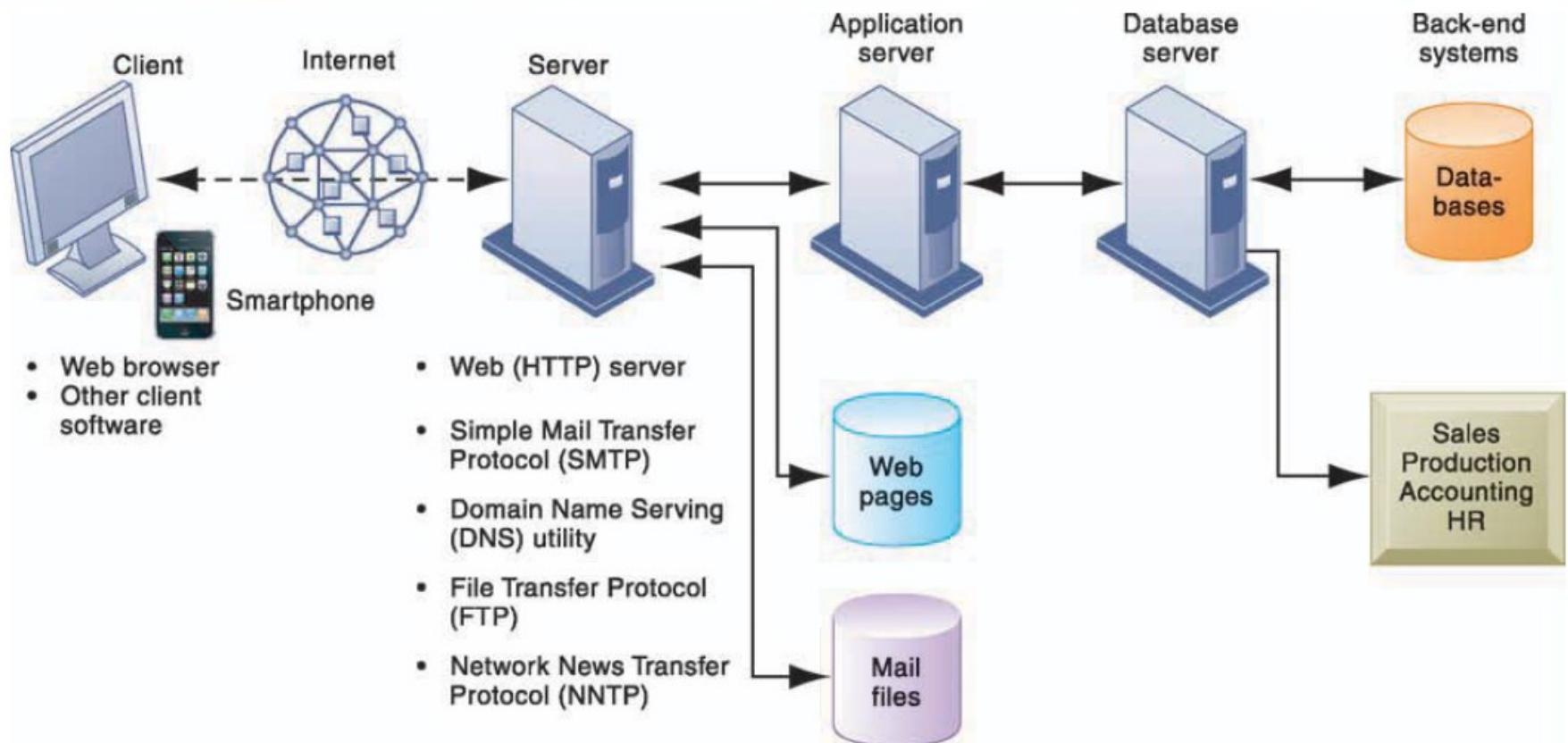


**TABLE 7.3 MAJOR INTERNET SERVICES**

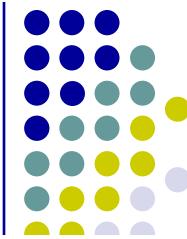
CAPABILITY	FUNCTIONS SUPPORTED
E-mail	Person-to-person messaging; document sharing
Chatting and instant messaging	Interactive conversations
Newsgroups	Discussion groups on electronic bulletin boards
Telnet	Logging on to one computer system and doing work on another
File Transfer Protocol (FTP)	Transferring files from computer to computer
World Wide Web	Retrieving, formatting, and displaying information (including text, audio, graphics, and video) using hypertext links



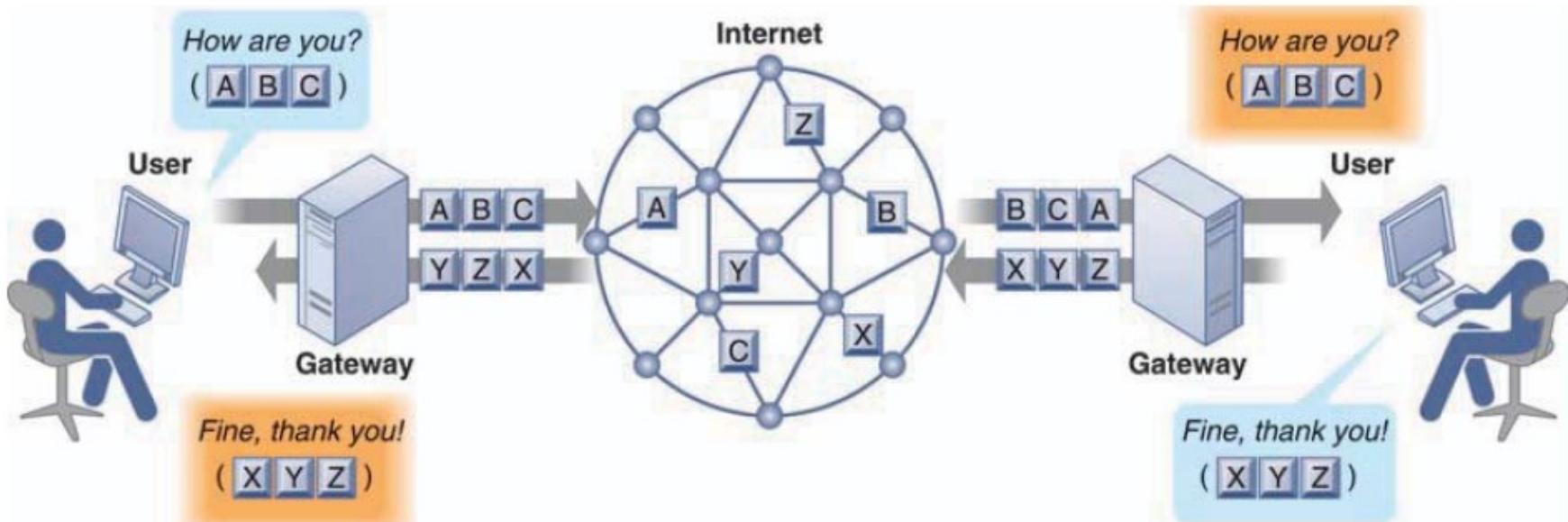
## FIGURE 7.8 CLIENT/SERVER COMPUTING ON THE INTERNET



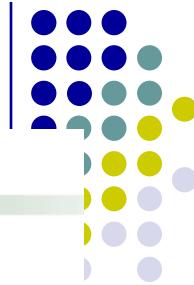
Client computers running Web browser and other software can access an array of services on servers over the Internet. These services may all run on a single server or on multiple specialized servers.



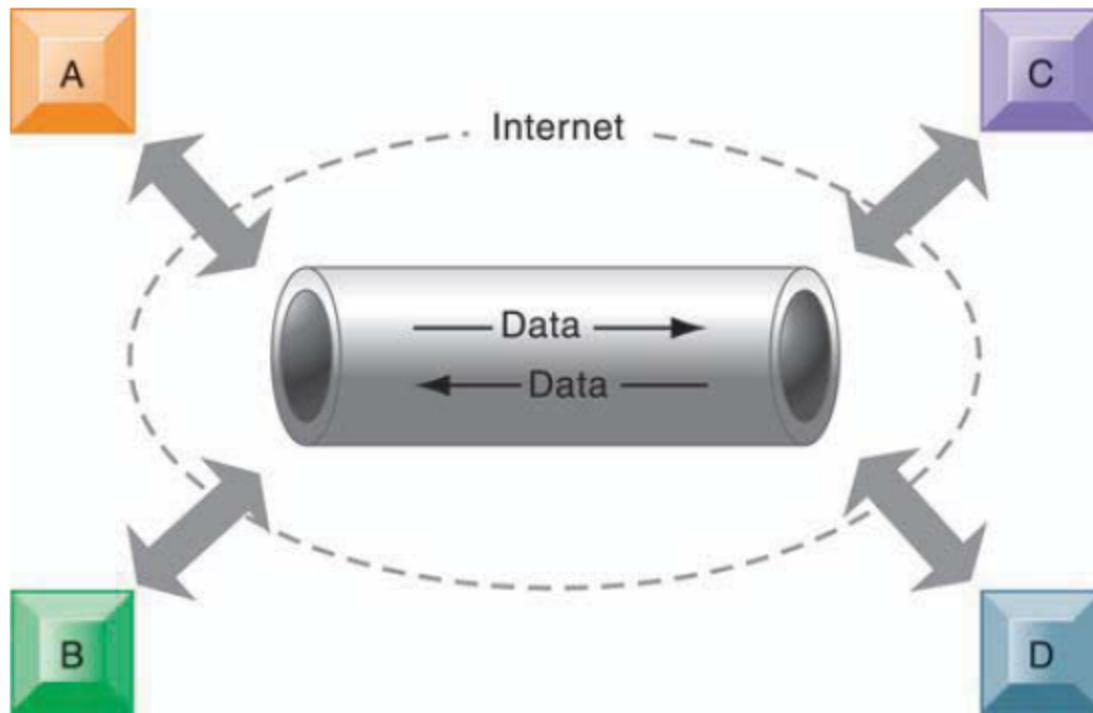
## FIGURE 7.9 HOW VOICE OVER IP WORKS



A VoIP phone call digitizes and breaks up a voice message into data packets that may travel along different routes before being reassembled at the final destination. A processor nearest the call's destination, called a gateway, arranges the packets in the proper order and directs them to the telephone number of the receiver or the IP address of the receiving computer.



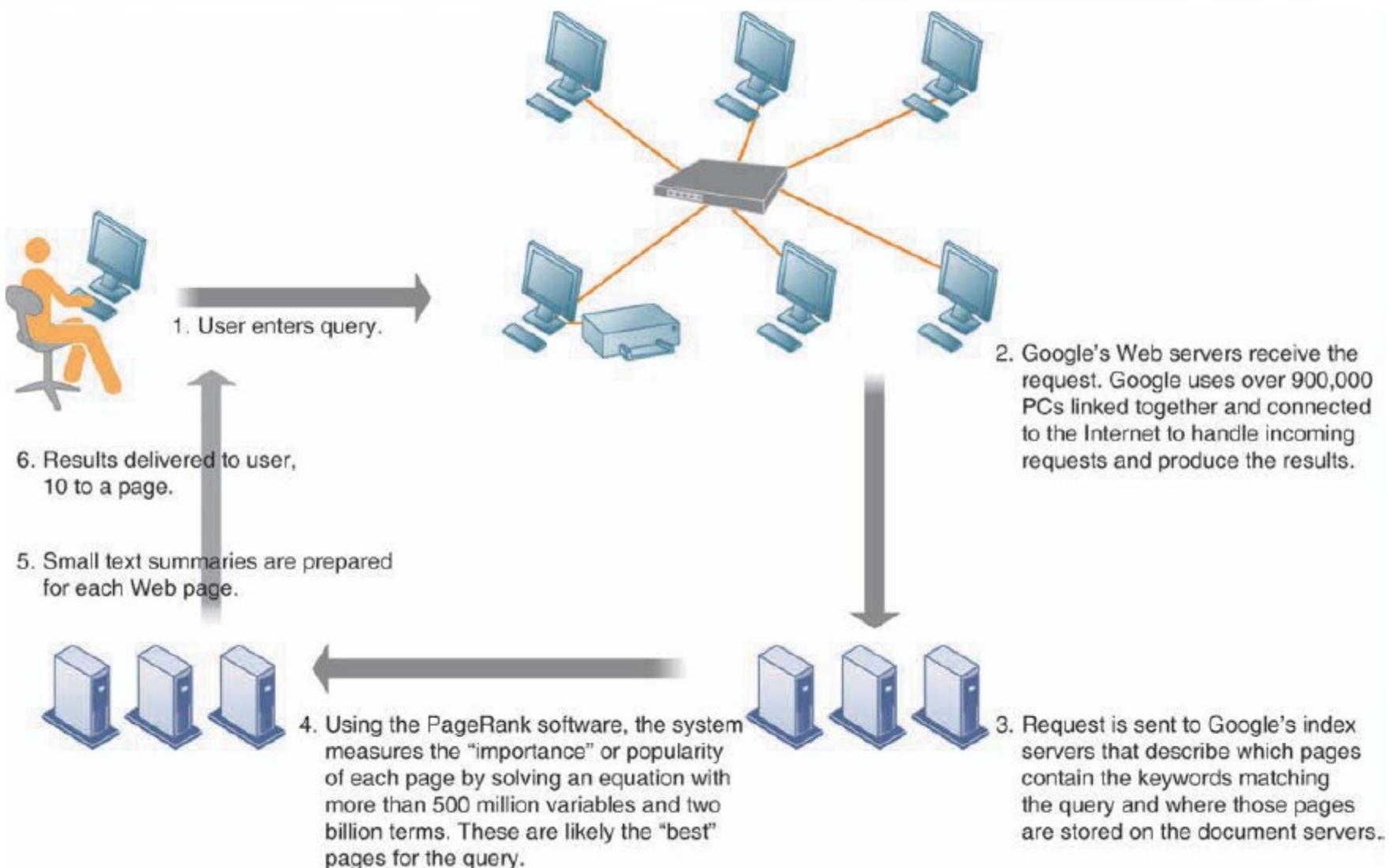
## FIGURE 7.10 A VIRTUAL PRIVATE NETWORK USING THE INTERNET



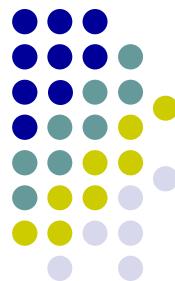
This VPN is a private network of computers linked using a secure “tunnel” connection over the Internet. It protects data transmitted over the public Internet by encoding the data and “wrapping” them within the Internet Protocol (IP). By adding a wrapper around a network message to hide its content, organizations can create a private connection that travels through the public Internet.



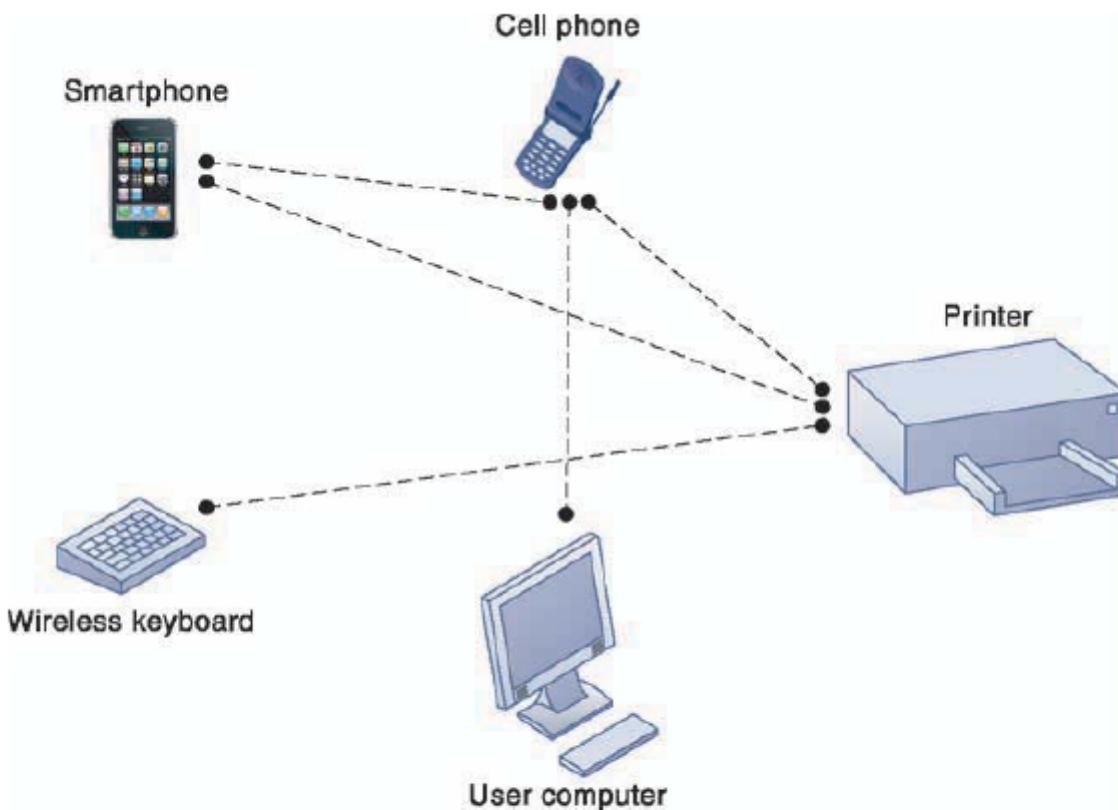
## FIGURE 7.12 HOW GOOGLE WORKS



The Google search engine is continuously crawling the Web, indexing the content of each page, calculating its popularity, and storing the pages so that it can respond quickly to user requests to see a page. The entire process takes about one-half second.

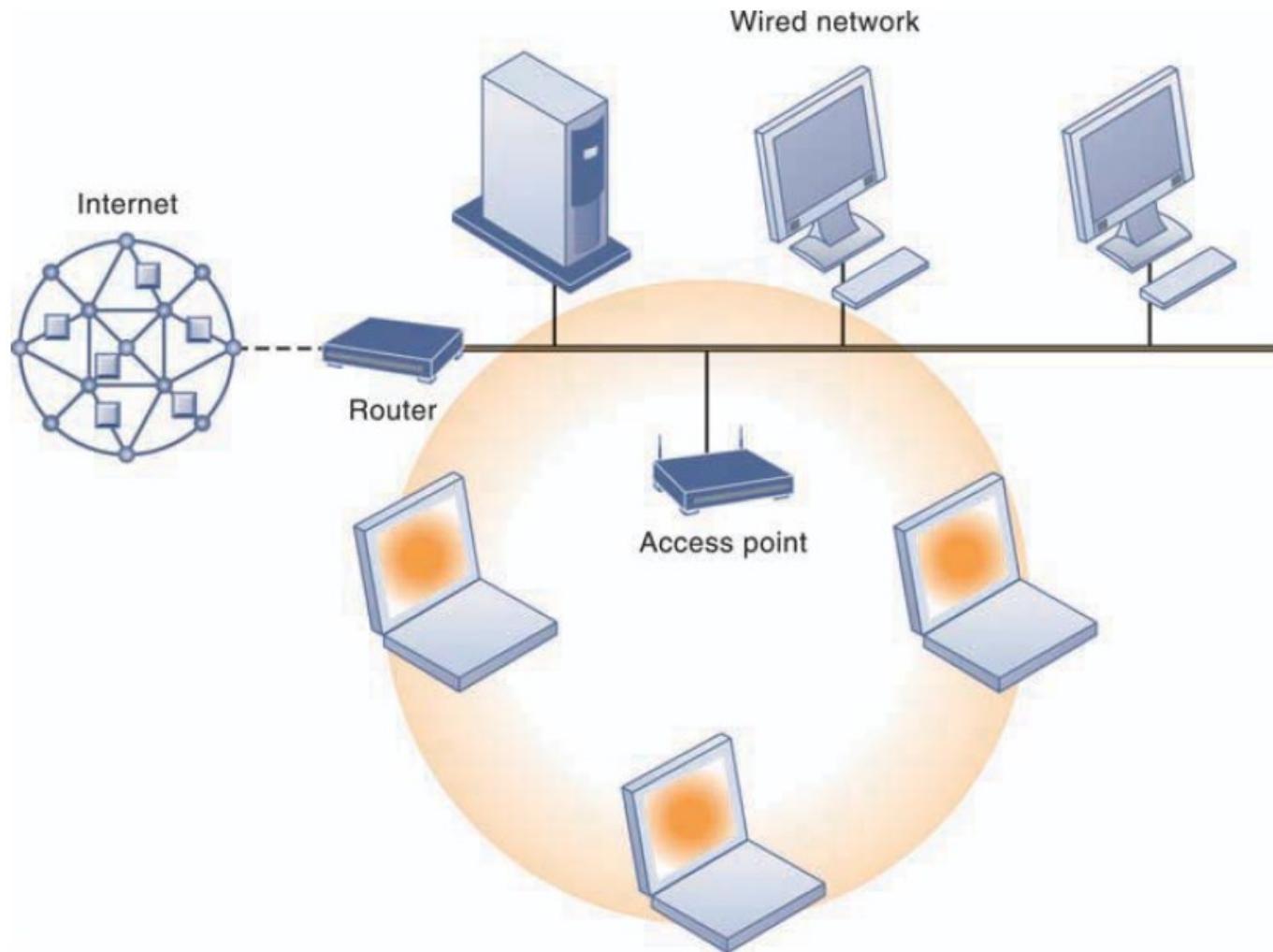


**FIGURE 7.13 A BLUETOOTH NETWORK (PAN)**

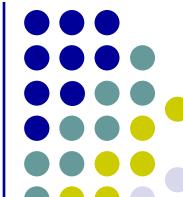


Bluetooth enables a variety of devices, including cell phones, smartphones, wireless keyboards and mice, PCs, and printers, to interact wirelessly with each other within a small 30-foot (10-meter) area. In addition to the links shown, Bluetooth can be used to network similar devices to send data from one PC to another, for example.

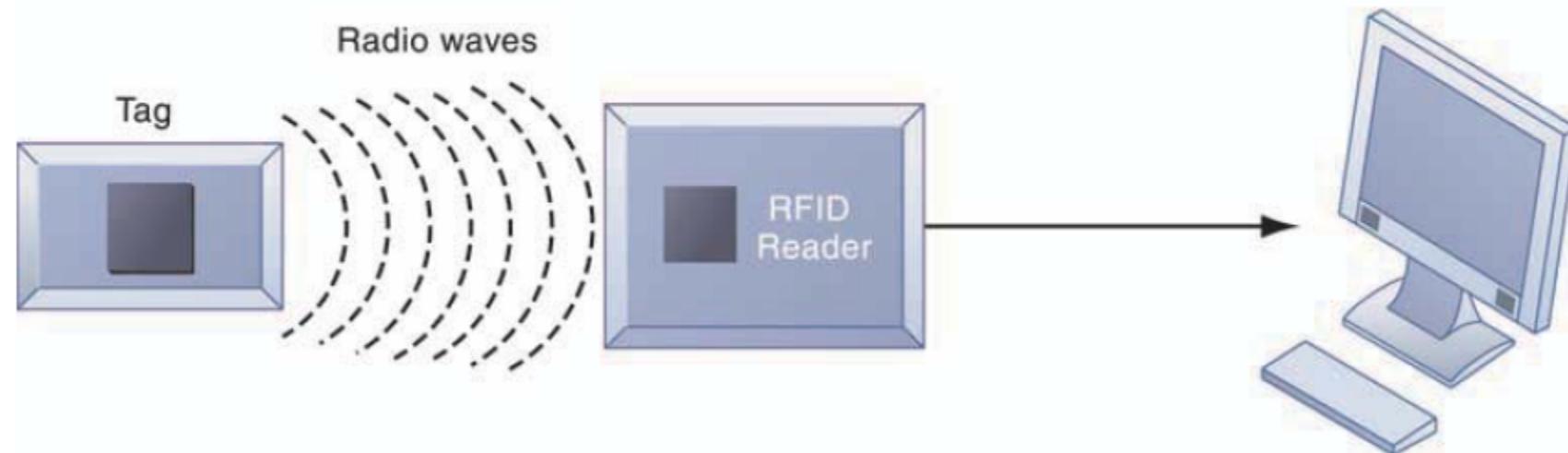
**FIGURE 7.14 AN 802.11 WIRELESS LAN**



Mobile laptop computers equipped with network interface cards link to the wired LAN by communicating with the access point. The access point uses radio waves to transmit network signals from the wired network to the client adapters, which convert them into data that the mobile device can understand. The client adapter then transmits the data from the mobile device back to the access point, which forwards the data to the wired network.



Host computer



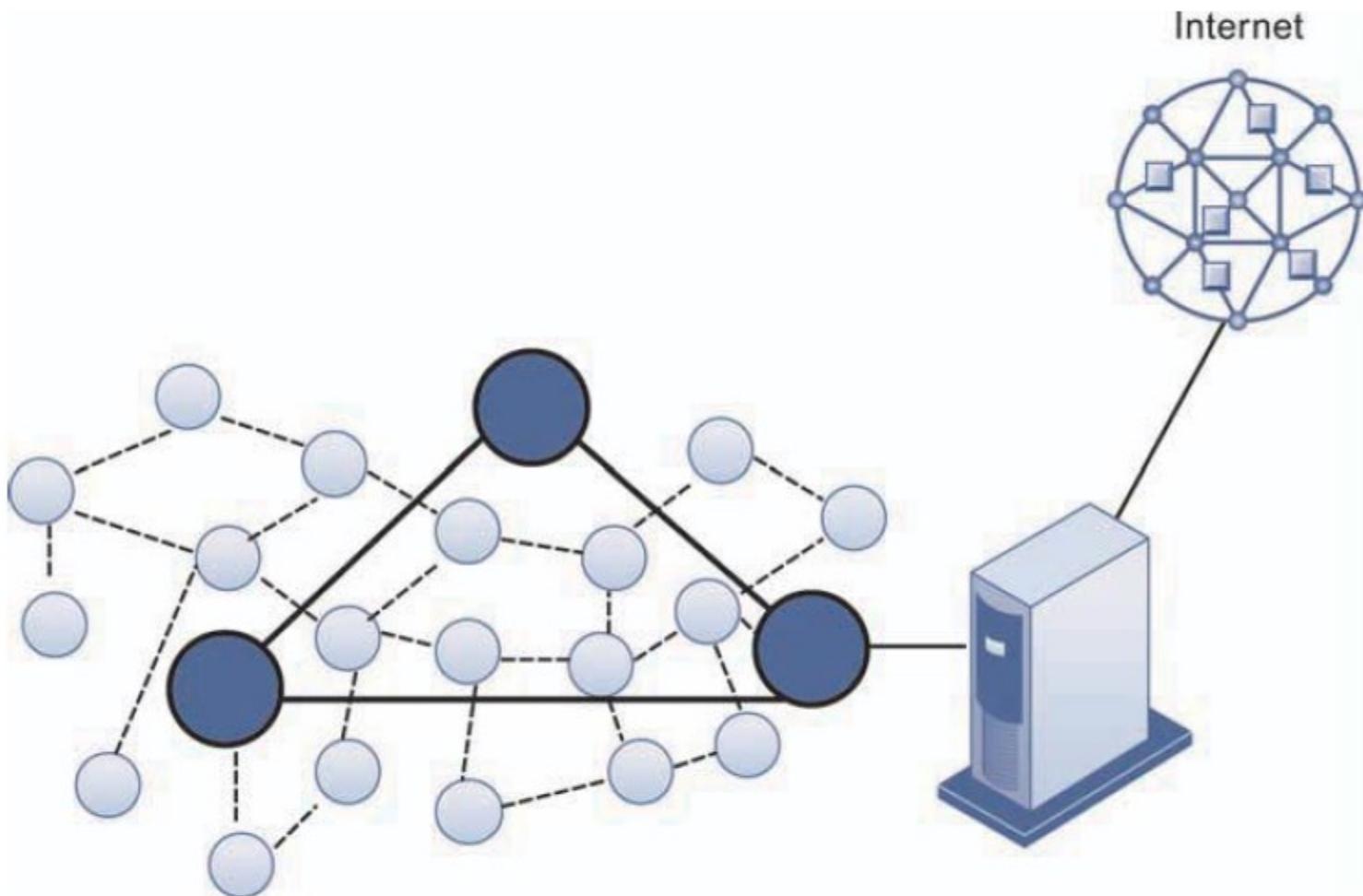
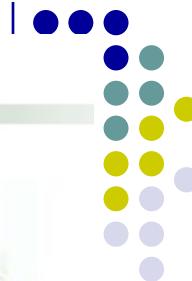
A microchip holds data including an identification number. The rest of the tag is an antenna that transmits data to a reader.

Has an antenna that constantly transmits. When it senses a tag, it wakes it up, interrogates it, and decodes the data. Then it transmits the data to a host system over wired or wireless connections.

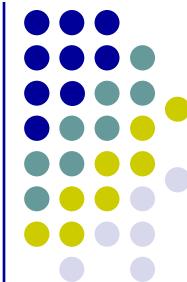
Processes the data from the tag that have been transmitted by the reader.

RFID uses low-powered radio transmitters to read data stored in a tag at distances ranging from 1 inch to 100 feet. The reader captures the data from the tag and sends them over a network to a host computer for processing.

## FIGURE 7.16 A WIRELESS SENSOR NETWORK



The small circles represent lower-level nodes and the larger circles represent high-end nodes. Lower-level nodes forward data to each other or to higher-level nodes, which transmit data more rapidly and speed up network performance.



# Bài tập, thảo luận

- Hạ tầng CNTT trong HTTT.
- Phần cứng.
- Phần mềm.
- Hệ quản trị CSDL và quản lý thông tin.
- Mạng máy tính

*Tại Học viện KTQS?*