



# 1: Information System Concepts and Technologies

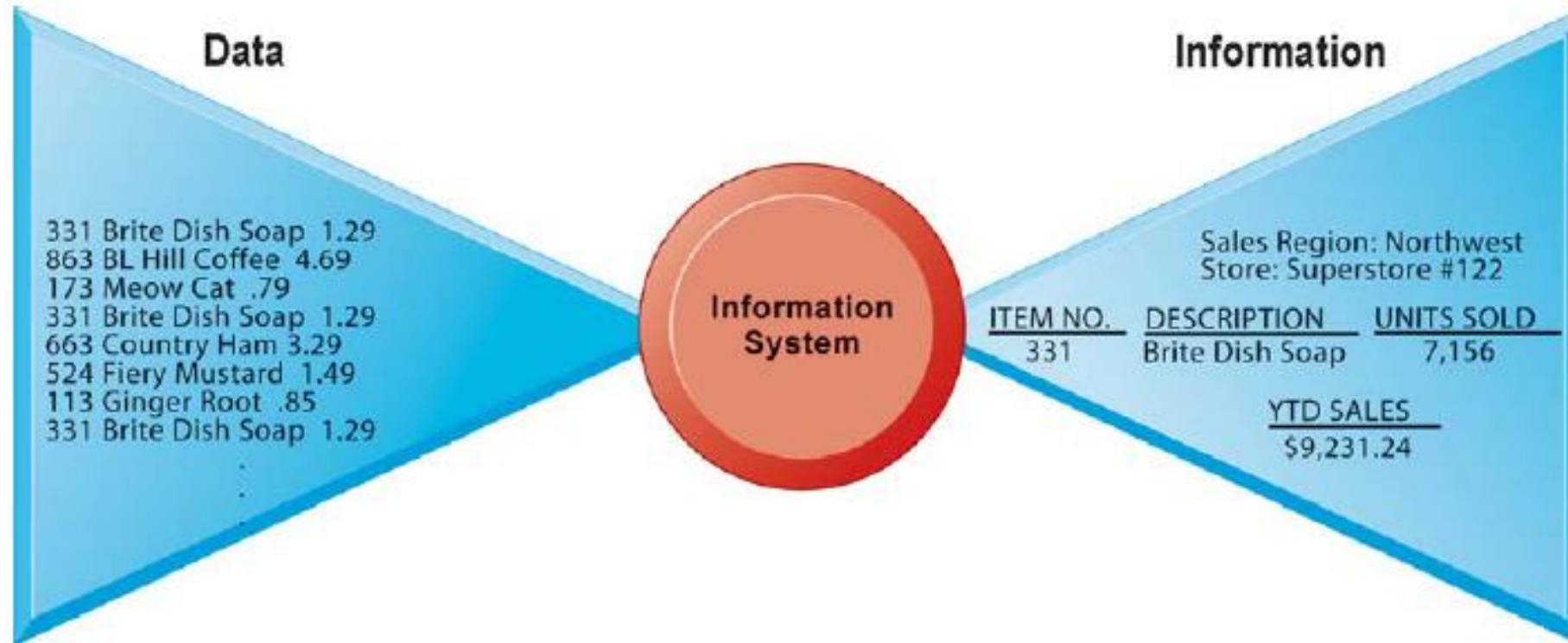
## IT1106 - Information Systems

**Level I - Semester 1**

# **Lesson 1: Information System Concepts and Technologies**

1. Information System Concepts
2. Managing Information in the Digital World
3. Computer-Based Information Systems
4. Information Technology infrastructure in an organization
5. Components of Information System Infrastructure
  - i. Computer Hardware and Mobile Devices
  - ii. Computer Software and Mobile Apps
  - iii. Network, Communication and Cloud Systems

# Information System Concepts



Raw data from a supermarket checkout counter can be processed and organized to produce meaningful information, such as the total unit sales of dish detergent or the total sales revenue from dish detergent for a specific store or sales territory.

# Characteristics of Quality Information

Characteristic	Definition
Accessible	Information should be easily accessible by authorized users so they can obtain it in the right format and at the right time to meet their needs.
Accurate	Accurate information is error free. In some cases, inaccurate information is generated because inaccurate data is fed into the transformation process. This is commonly called garbage in, garbage out.
Complete	Complete information contains all the important facts. For example, an investment report that does not include all important costs is not complete.
Economical	Information should also be relatively economical to produce. Decision makers must always balance the value of information with the cost of producing it.

# Characteristics of Quality...Contd.

Flexible	Flexible information can be used for a variety of purposes. For example, information on how much inventory is on hand for a particular part can be used by a sales representative in closing a sale, by a production manager to determine whether more inventory is needed, and by a financial executive to determine the amount of money the company has invested in inventory.
Relevant	Relevant information is important to the decision maker. Information showing that lumber prices might drop is probably not relevant to a computer chip manufacturer.
Reliable	Reliable information can be trusted by users. In many cases, the reliability of the information depends on the reliability of the data-collection method. In other instances, reliability depends on the source of the information. A rumor from an unknown source that oil prices might go up may not be reliable.

Active

# Characteristics of Quality...Contd.

Secure	Information should be secure from access by unauthorized users.
Simple	Information should be simple, not complex. Sophisticated and detailed information might not be needed. In fact, too much information can cause information overload, whereby a decision maker has too much information and is unable to determine what is really important.
Timely	Timely information is delivered when it is needed. Knowing last week's weather conditions will not help when trying to decide what coat to wear today.
Verifiable	Information should be verifiable. This means that you can check it to make sure it is correct, perhaps by checking many sources for the same information.



# Information System Concepts...Contd.

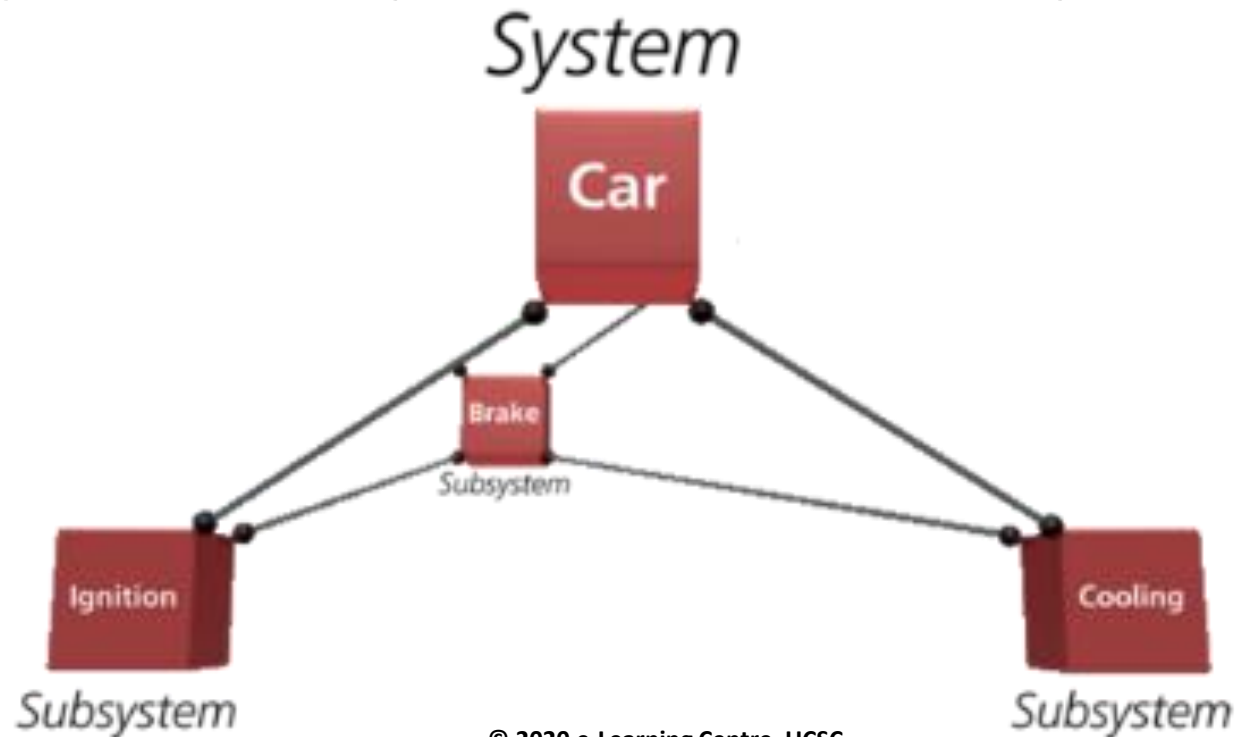
- What is a System?

*A system is a set of interrelated components, with a clearly defined boundary, working together to achieve a common set of objectives [Ref2].*



# Sub System & sub-subsystem

- **subsystem** is a system within a system. A system is made up of sub systems.
- **sub-subsystem** is a system within a sub system.

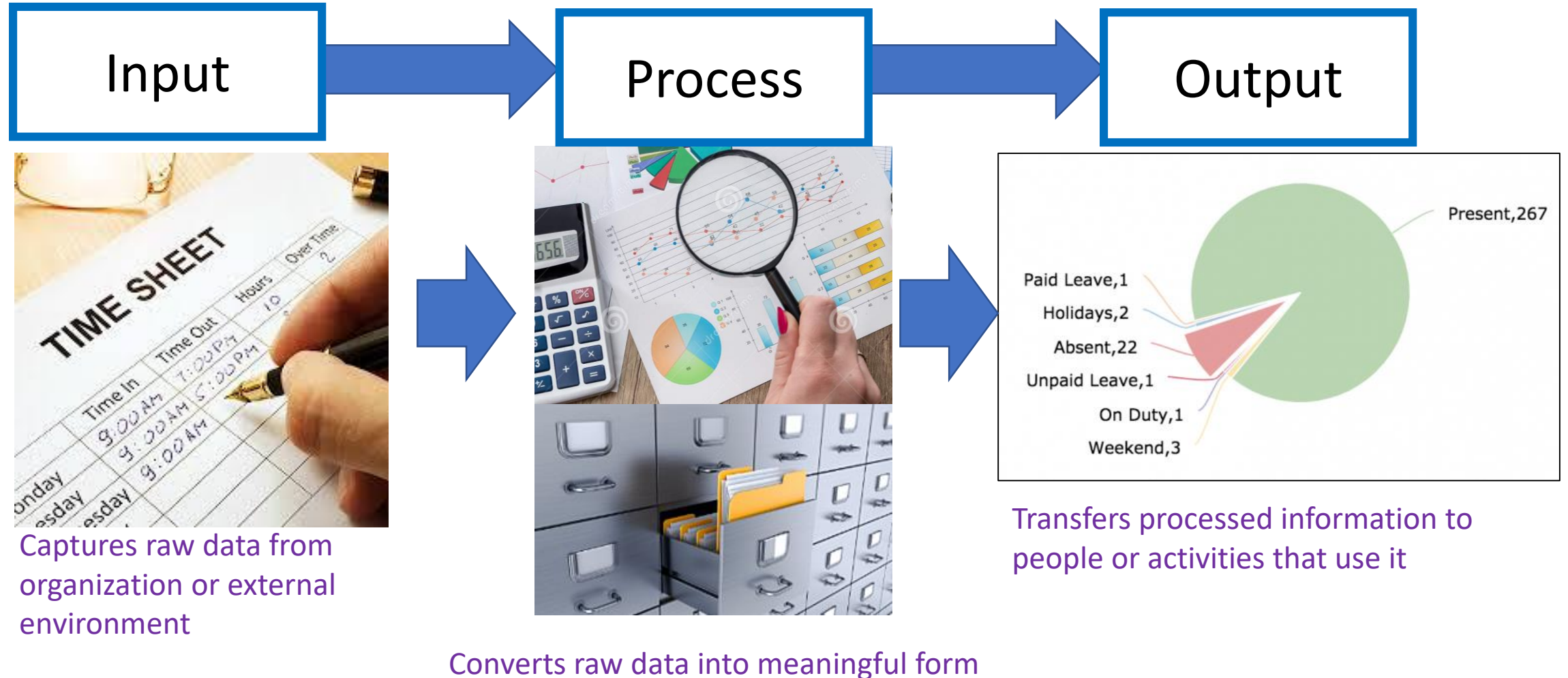




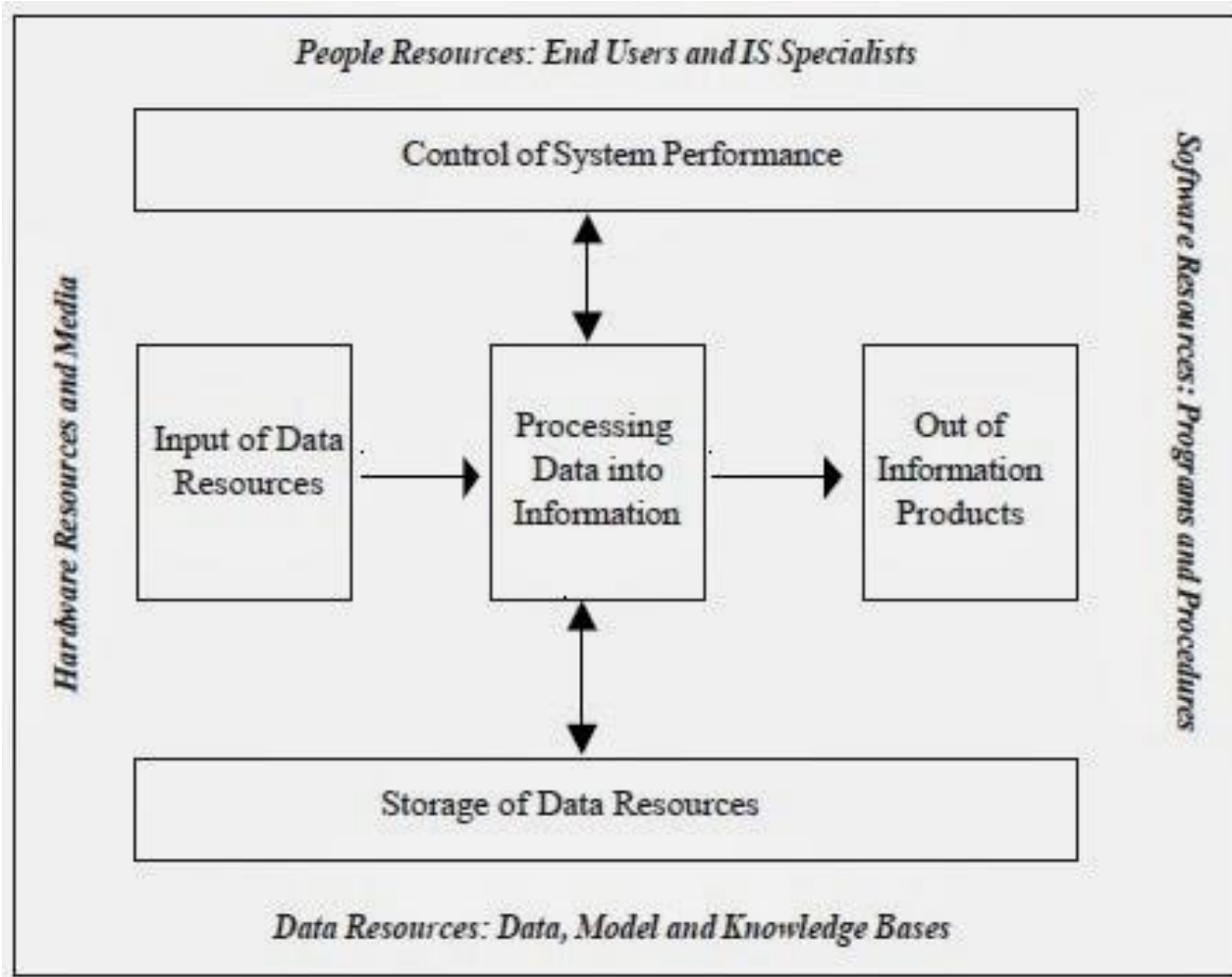
# Closed Systems versus Open Systems

- Systems can be considered;
  - Closed or
  - Open
- Open systems exchange information, energy, or material with their environments.
  - Biological and social systems are inherently open systems;
  - Mechanical systems may be open or closed.
- The concepts of open and closed systems are difficult to defend in the absolute.
- Most of scholars consider this as a relative factor

# An Information System



# Computer-Based Information System



A CBIS can be any organized combination of people, hardware, software, communications networks, data resources, and policies and procedures that stores, retrieves, transforms, and disseminates information in an organization.

# Components of a computer-based Information System





# Activity

Identify the input and output devices, processor and storage devices. Drag and drop the name labels on the appropriate tag area marked on the image.

Input  
devices

Output  
devices

Storage  
Devices

Processor



# Managing Information in the Digital World

- People in the present world are knowledge workers.
- They live in a knowledge society.
- Every organization involve in e-business.
- There are five major technologies that shape the society.
  - Mobile
  - Social media
  - Internet of things
  - Cloud computing
  - Big data



# IT Infrastructure in an Organization

Set of H/W and S/W required to operate entire enterprise

## 1. Technical-IT infrastructure

- Computer Hardware and Mobile Devices
- Software and Data
- Network Devices

## 2. Human-IT infrastructure

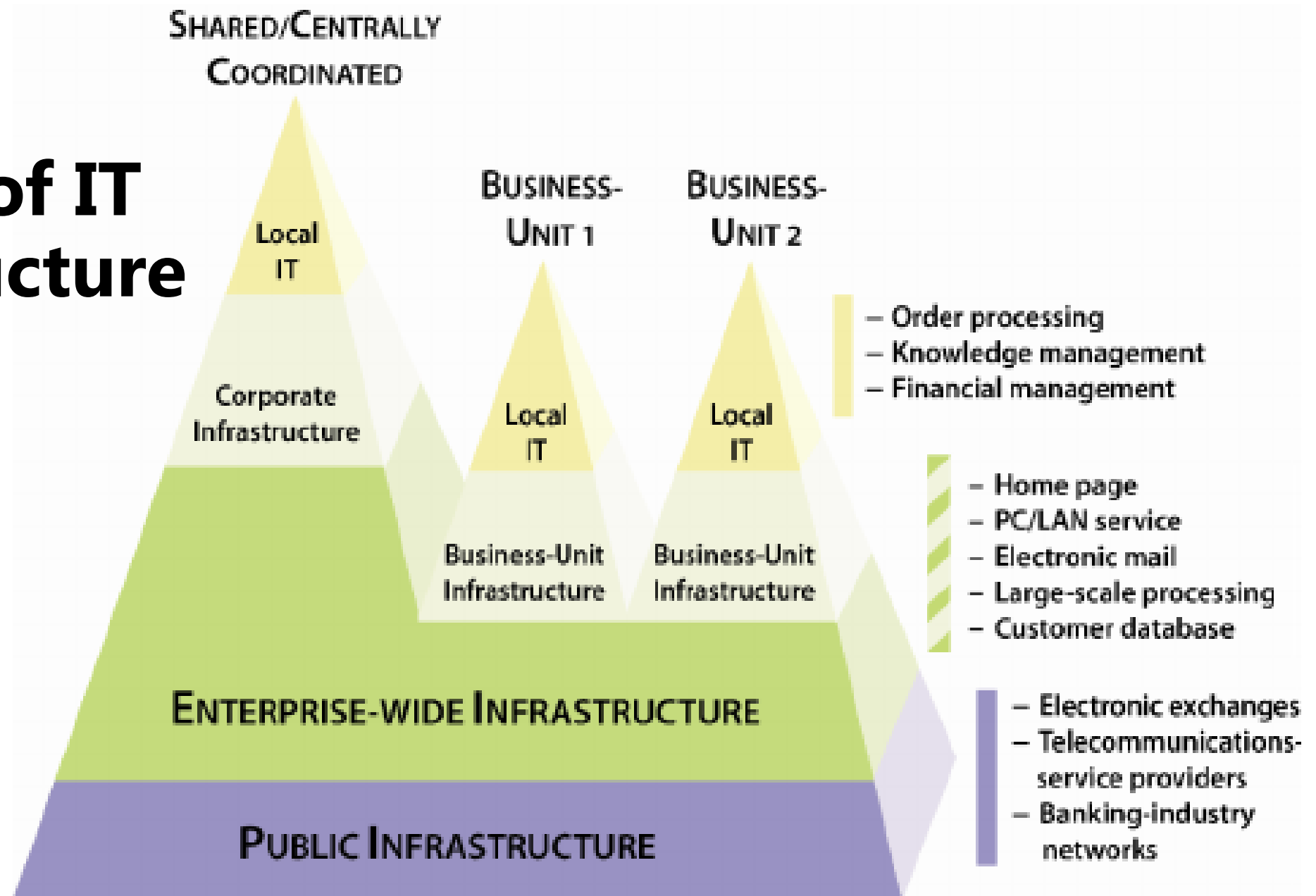
- Data workers and other IT personnel with knowledge and capabilities required to manage organizational IT resources



# Effective IT Infrastructure should be;

- Flexible
  - Characterized with connectivity,
  - compatibility, and
  - modularity.
- Robust
  - provide data and information to users with the appropriate levels of accuracy, timeliness, reliability, security, and confidentiality
  - enables employees to perform their duties, having both the available technology and the necessary technological skills.

# Levels of IT Infrastructure

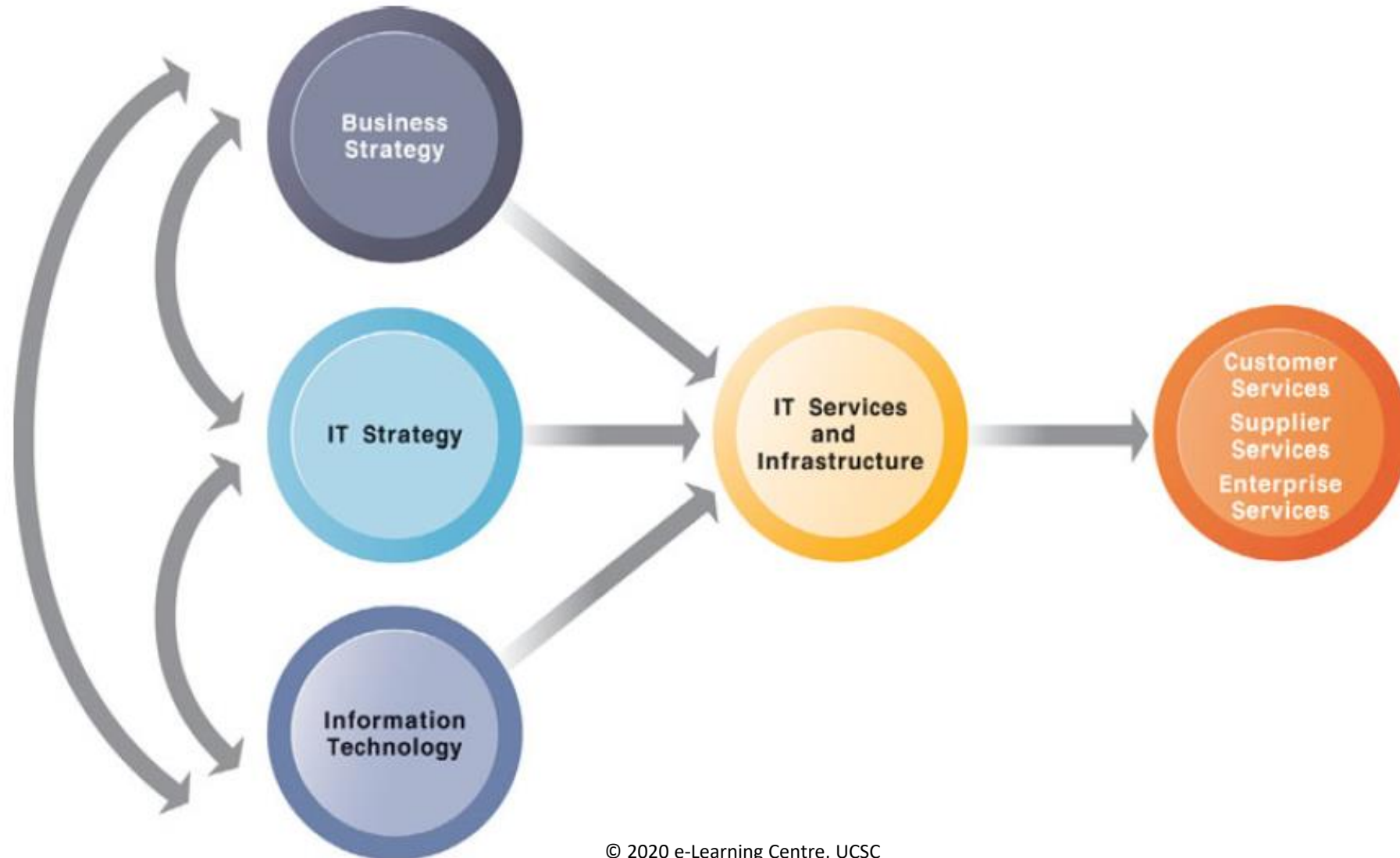


Sources: Weill, Subramani, and Broadbent (2002, p. 59)

# Activity

- **Enterprise-wide infrastructure includes** services such as \_\_\_\_\_ and an increasing array of enterprise-wide software applications.
  1. e-mail
  2. Public telecommunication network
  3. a central corporate Web site
  4. Point-of-sales system
  5. corporate-**wide** intranets

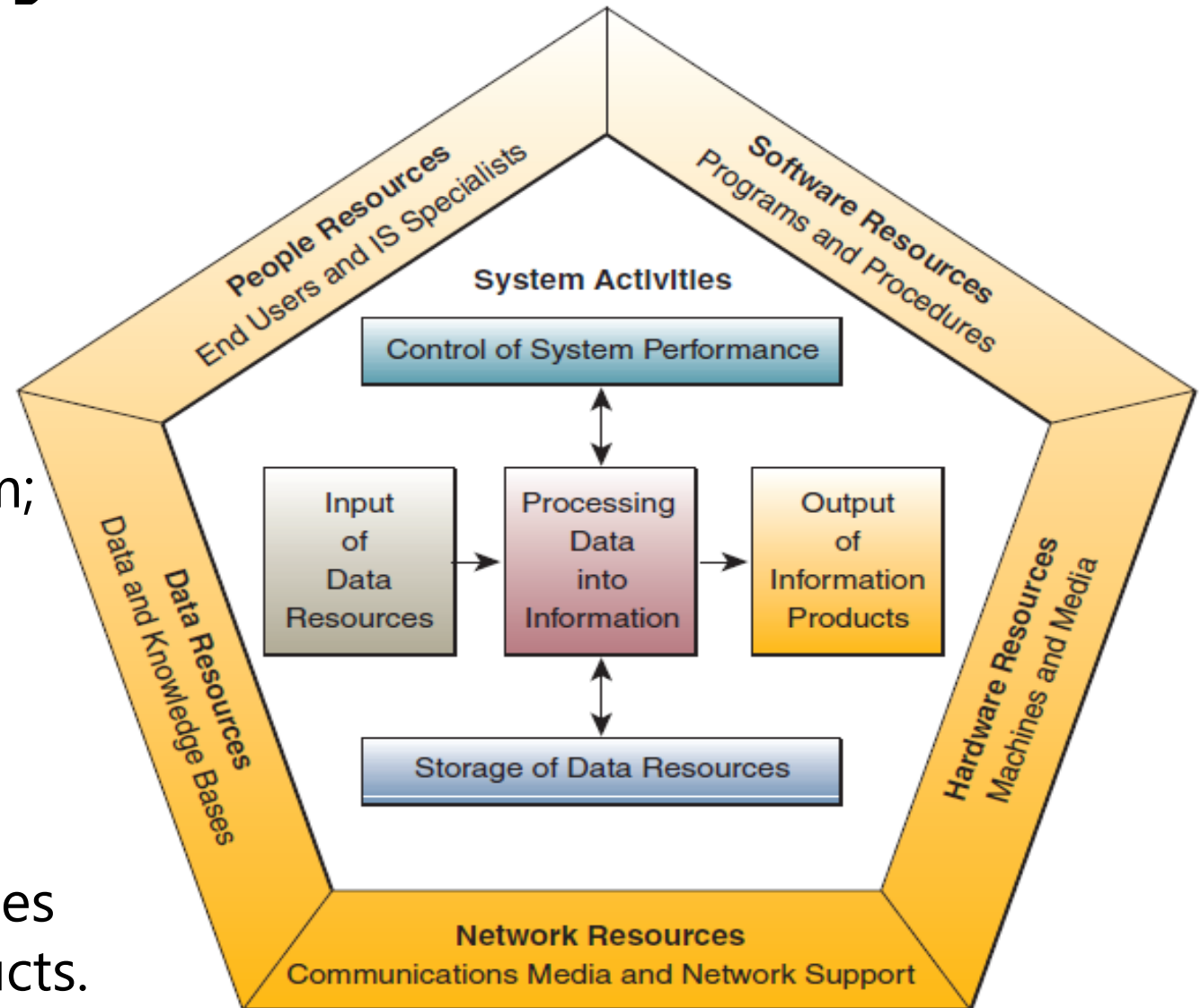
# IT Infrastructure and Business Capability



# Information System Infrastructure

Information systems use;

- **people,**
- **hardware,**
- **software,**
- **data, and**
- **network** resources to perform;
  - input,
  - processing,
  - output,
  - storage, and
  - control activities that transform data resources into information products.



# IS Resources and Products

## People Resources

Specialists—systems analysts, software developers, systems operators.

End Users—anyone else who uses information systems.

## Hardware Resources

Machines—computers, video monitors, magnetic disk drives, printers, optical scanners.

Media—floppy disks, magnetic tape, optical disks, plastic cards, paper forms, removable storage media.

## Software Resources

Programs—operating system programs, spreadsheet programs, word processing programs, payroll programs.

Procedures—data entry procedures, error correction procedures, paycheck distribution procedures.

## Data Resources

Product descriptions, customer records, employee files, inventory databases.

## Network Resources

Communications media, communications processors, network access, control software.

## Information Products

Management reports and business documents using text and graphics displays, audio responses, and paper forms.

# People Resources

- **End users** : People who use an information system or the information it produces.
  - E.g. customers, salespersons, engineers, clerks, accountants, or managers in all levels of an organization
  - Includes **knowledge workers** - who spend most of their time communicating and collaborating in teams and workgroups and creating, using, and distributing information.
- **IS specialists**: People who develop and operate information systems.
  - E.g. systems analysts, software developers, system operators, and other managerial, technical, and clerical IS personnel.



# Hardware Resources

- An integral part of infrastructure
- All tangible resources
  - Computer systems
  - Computer peripherals
  - Networking devices

# Computer Hardware and Mobile Devices



# Single User Computers

Portable Computers				
Factor	Smartphone	Laptop	Notebook/Ultrabook	Tablet
Cost	\$150–\$1,000	\$300–\$3,000	\$300–\$800	\$75–\$1,500
Weight (pounds)	<0.5	<6	<3	<2
Screen size (inches)	2–5.5	<20	<12	<13
Typical use	Combines a cell phone with a hand-held computer; run apps and text messaging services; access network and the Internet wirelessly	Run worker productivity software, access the Internet, play games, listen to music, and watch videos	Smaller version of a laptop, with sufficient processing power to run nearly every business application	Capture data at the point of contact, read email, access the Internet, read e-books, view photos, play games, listen to music, and watch videos
Nonportable Computers				
Factor	Thin Client	Desktop	Nettop	Workstation
Cost	\$200–\$500	\$500–\$3,000	\$150–\$350	\$1,500–\$9,500
Weight (pounds)	<3	20–30	<5	<20–35
Typical use	Enter data and access applications via the Internet; can be portable or non-portable	Run worker productivity software, access the Internet, play games, listen to music, and watch videos	Small, limited capacity desktop computer; performs basic tasks such as Internet surfing, accessing Web-based applications, document processing, and audio/video playback[	Powerful desktop capable of performing engineering, computer aided design, and software development functions

# Multiple-User Systems

Multiple-User Computers			
Factor	Server	Mainframe	Supercomputer
Cost	>\$500	>\$75,000	>\$250,000
Weight (pounds)	>25	>100	>100
Typical use	Execute network and Internet applications	Execute computing tasks for large organizations and provide massive data storage	Run scientific applications; perform intensive number crunching

Most Powerful Operational Supercomputers in the world						
Rank	Name	Manufacturer	Research Center	Location	Number of Cores	Speed (Petaflops)
1	Tianhe-2	NUDT	National University of Defense Technology (NUDT)	China	3.1 million	33.9
2	Titan	Cray	Oak Ridge National Laboratory	United States	0.56 million	17.6
3	Sequoia	IBM	Lawrence Livermore National Laboratory	United States	1.5 million	17.2
4	K	Fujitsu	Riken Advanced Institute for Computational Science	Japan	0.75 million	10.5
5	Mira	IBM	Argonne National Laboratory	United States	0.8 million	8.6

# Peripherals for a Business PC

- **Monitors.** Bigger is better for computer screens. Consider a high-definition 19-inch or 21-inch flat screen CRT monitor, or LCD flat-panel display. That gives you much more room to display spreadsheets, Web pages, lines of text, open windows, and so on. An increasingly popular setup uses two monitors that allow multiple applications to be used simultaneously.
- **Printers.** Your choice is between laser printers and color inkjet printers. Lasers are better suited for high-volume business use. Moderately priced color inkjets provide high-quality images and are well suited for reproducing photographs; per-page costs are higher than for laser printers.
- **Scanners.** You'll have to decide between a compact, sheet-fed scanner and a flatbed model. Sheet-fed scanners will save desktop space, while bulkier flatbed models provide higher speed and resolution.
- **Hard Disk Drives.** Bigger is better; as with closet space, you can always use the extra capacity. So go for 80 gigabytes at the minimum to 160 gigabytes and more.
- **CD and DVD Drives.** CD and DVD drives are a necessity for software installation and multimedia applications. Common today is a built-in CD-RW/DVD drive that both reads and writes CDs and plays DVDs.
- **Backup Systems.** Essential. Don't compute without them. Removable magnetic disk drives and even CD-RW and DVD-RW drives are convenient and versatile for backing up your hard drive's contents.

# Hardware solutions

- Fluctuating computing needs - On-demand computing
- Large scale problems – Grid computing
- Cost issues related to bandwidth and processing speed
  - Edge computing
- Low reliability and high maintenance cost - Autonomic computing
- Cost, access and software select and update issues - Cloud Computing



# On-demand Computing

- Allocate available resources based on users' needs (on a pay-per-use basis)
- Rent resources from an external provider- Utility computing
  - Rent resources for processing, data storage, or networking, on an as-needed basis
  - Tenant receives a monthly bill for the services used
  - Service provider should do the tasks such as managing, maintaining, and upgrading the infrastructure
  - All charges are added to the utility bill



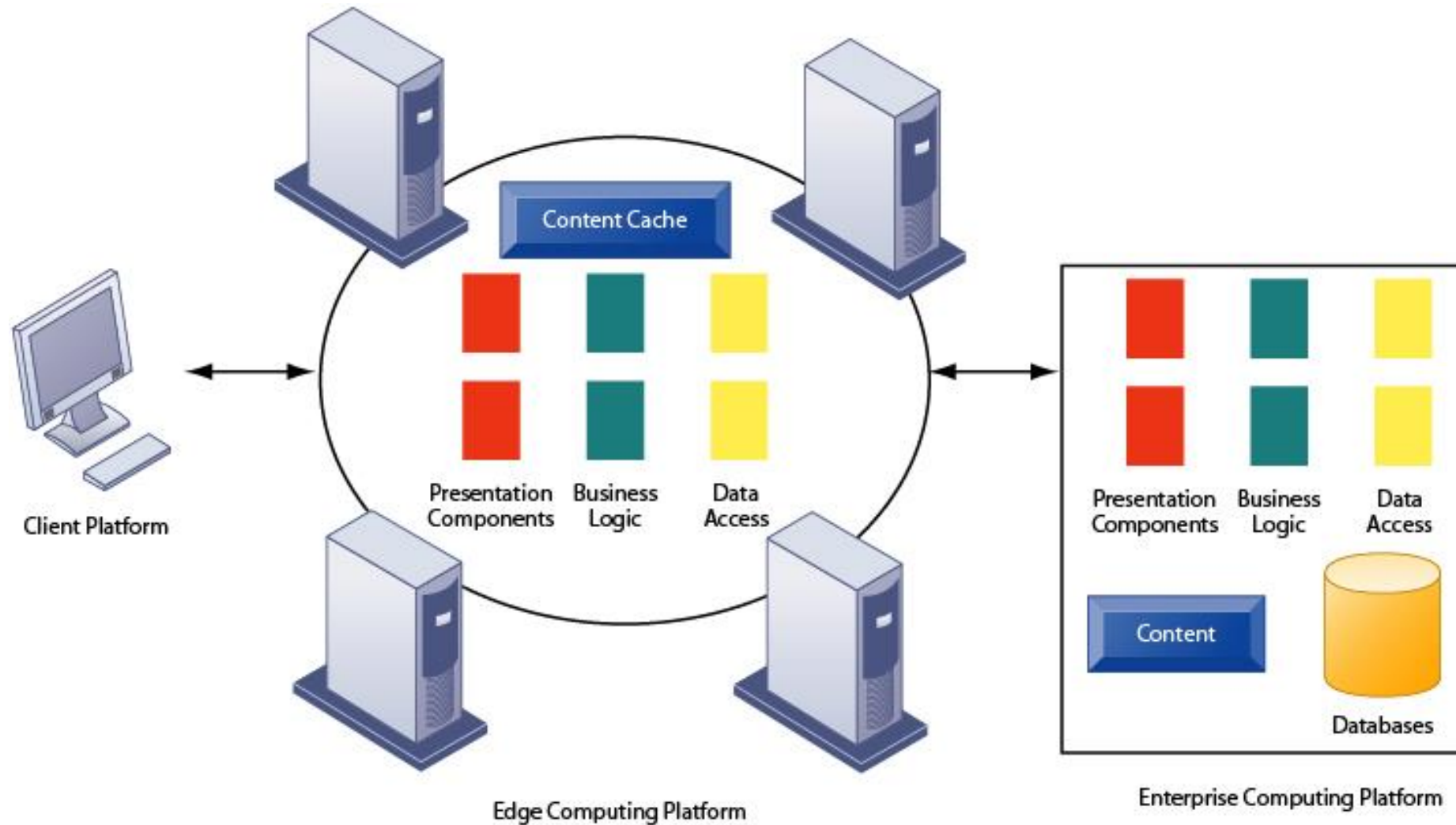
# Grid Computing

- To overcome cost or use limitations
  - Supercomputers are very expensive, cannot afford or justify
  - Some tasks are beyond the capacity of a available supercomputers
  - Can solve very large-scale problems as well as multiple smaller problems
  - Dedicated grids
    - To perform the grid's computing tasks and
    - Overcome speed issues



# Edge computing

For bandwidth and processing speed issues



# Autonomic computing



# Green Computing

- Minimize the impact on the environment
- Adopt better practices and technologies for designing, developing, using and disposing hardware
- Reduce power consumption



# Activity

Match the statements in column A with the options in column B

A

- Fluctuating computing needs
- Large scale problems
- Cost issues related to bandwidth and processing speed
- Low reliability and high maintenance cost

B

- Edge computing
- Autonomic computing
- On-demand computing
- Grid computing

# IS Infrastructure: Software

- Organizations have to rely on a variety of different software
- Continuously upgrading OSs and applications can be a huge cost factor (for labour and s/w)
- S/W infrastructure mgt. Approaches
  - using open-source software,
  - integrating various software tools
  - using application service providers

# Using Open Source Applications

- Open Source – free and source code is available for use and/or modification
- Open source operating systems - e.g. Linux
- Open source application software – e.g. Apache Web Server

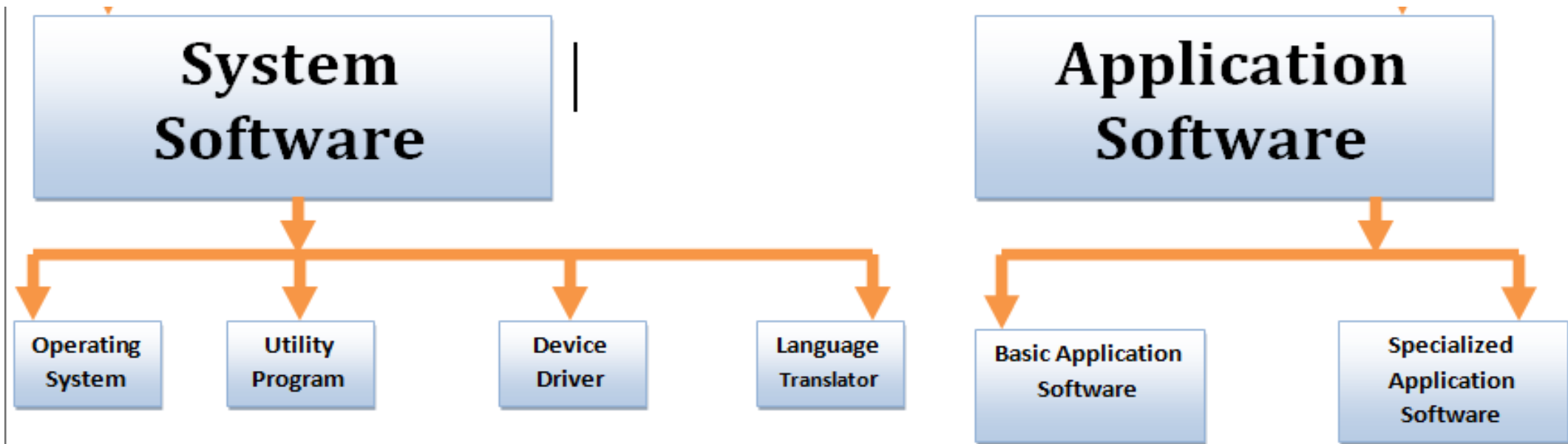


# Integrating s/w tools

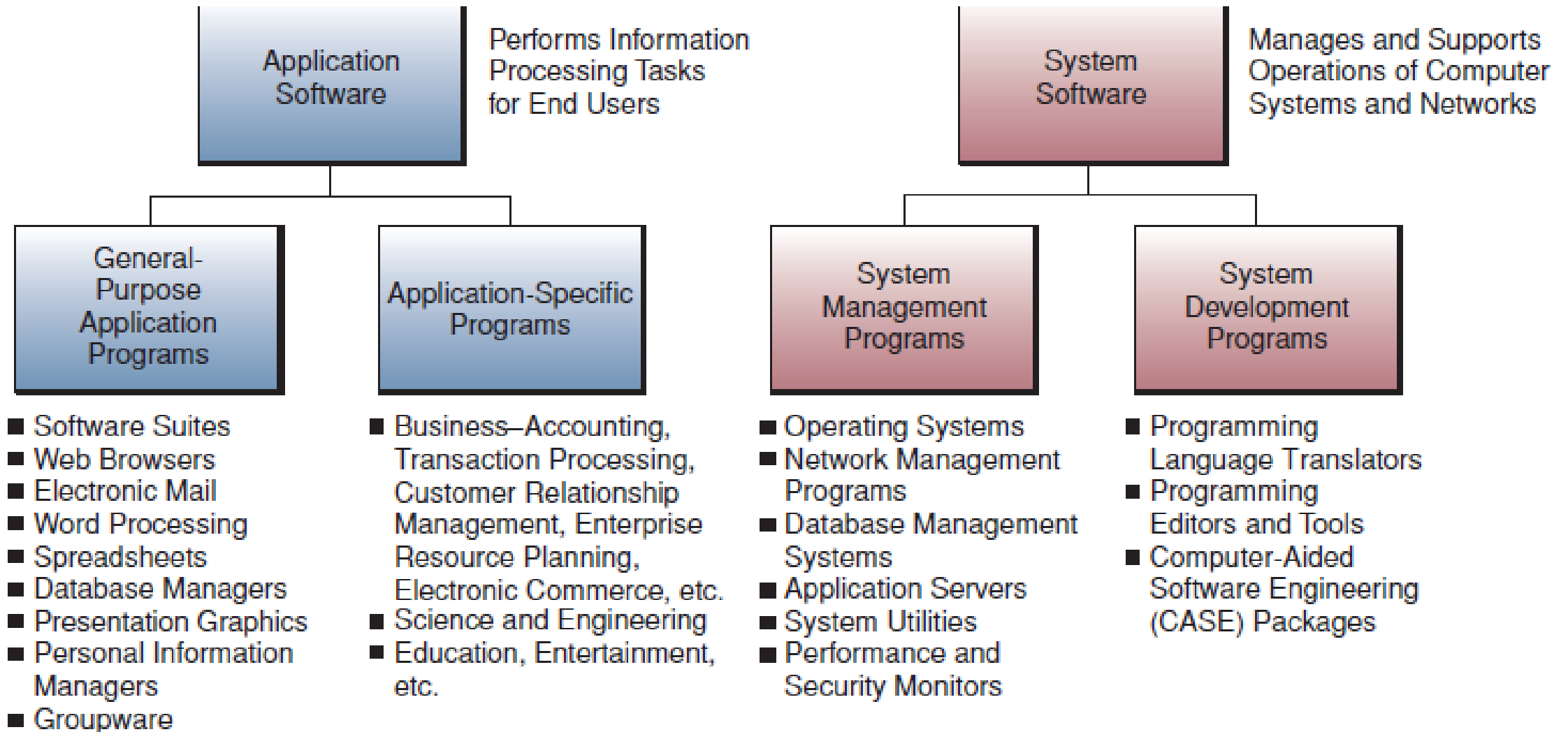
- Using software products which can interoperate very well
- Using web services which allow interaction of different programs and databases over a network (service-oriented architecture - SOA)
  - e.g. Google to integrate search functionality and
  - MapQuest to provide guests with an interactive map to the company head office and branches

# Software Types

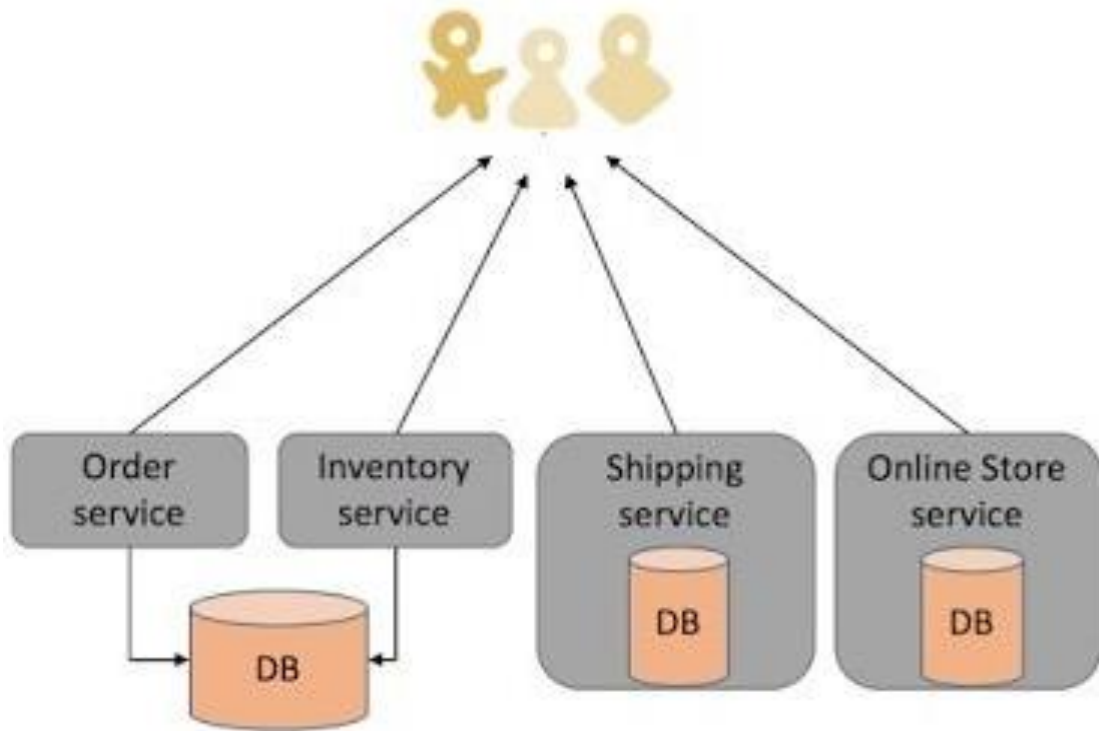
Software Type	Personal	Workgroup	Enterprise
Systems software	Smartphone, tablet, personal computer, and workstation operating systems	Network operating systems	Server and mainframe operating systems
Application software	Word-processing, spreadsheet, database, and graphics programs	Email, group-scheduling, shared-work, and collaboration applications	General-ledger, order-entry, payroll, and human-resources applications



# Software...Contd.

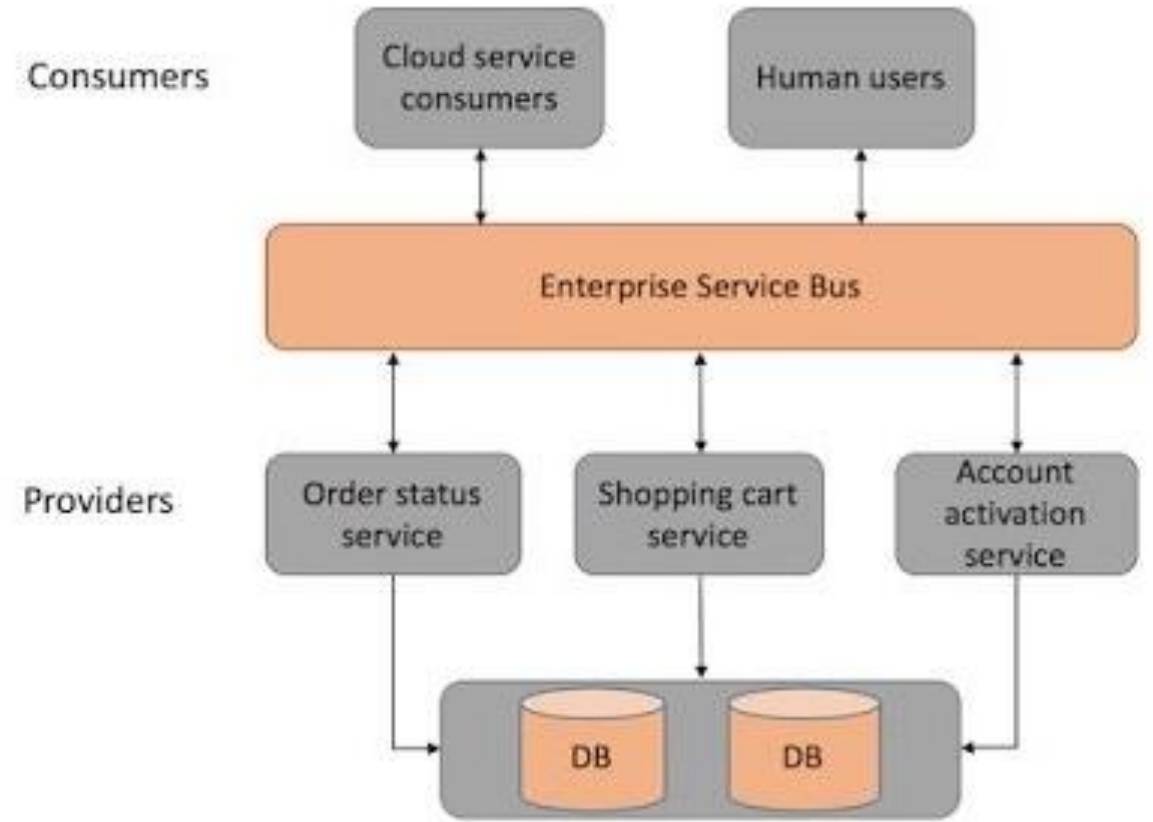


# Software Architectures



**Microservices Architecture**

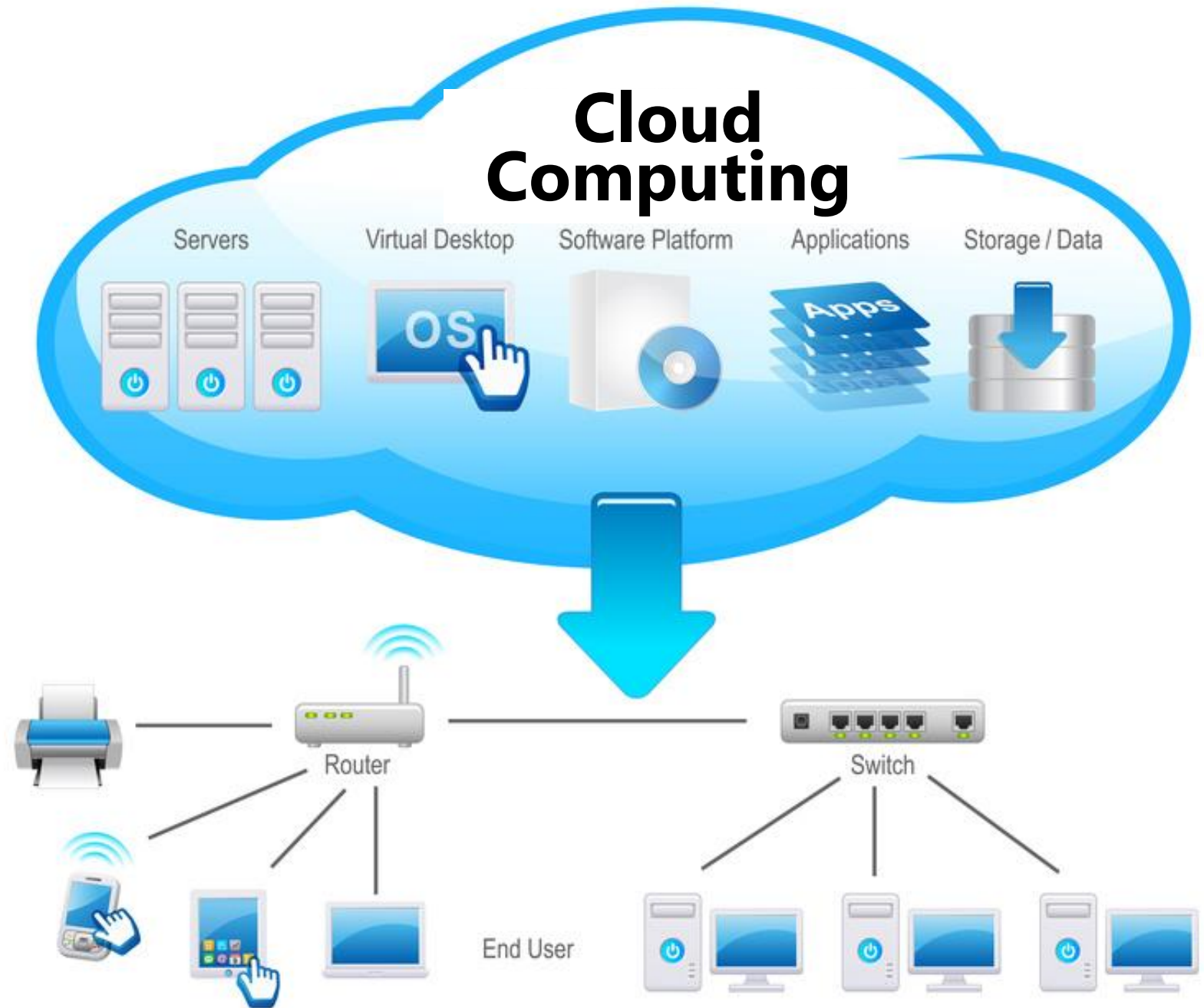
Used by Uber, Netflix, Google, and Amazon



**SOA Architecture**

# Cloud computing

- A computing method of providing software and virtualized hardware resources as a service over the Internet.
- Uses a **network of remote servers hosted on the Internet** to store, manage, and process data.







**SAAS**  
Software  
as a Service

Email  
CRM  
Collaborative  
ERP

**CONSUME**



**PAAS**  
Platform  
as a Service

Application Development  
Decision Support  
Web  
Streaming

**BUILD ON IT**



**IAAS**  
Infrastructure  
as a Service

Caching  
Legacy                      File  
Networking              Technical  
Security              System Mgmt

**MIGRATE TO IT**

# Activity

Match the phrases in column A with the software types in column B

## A

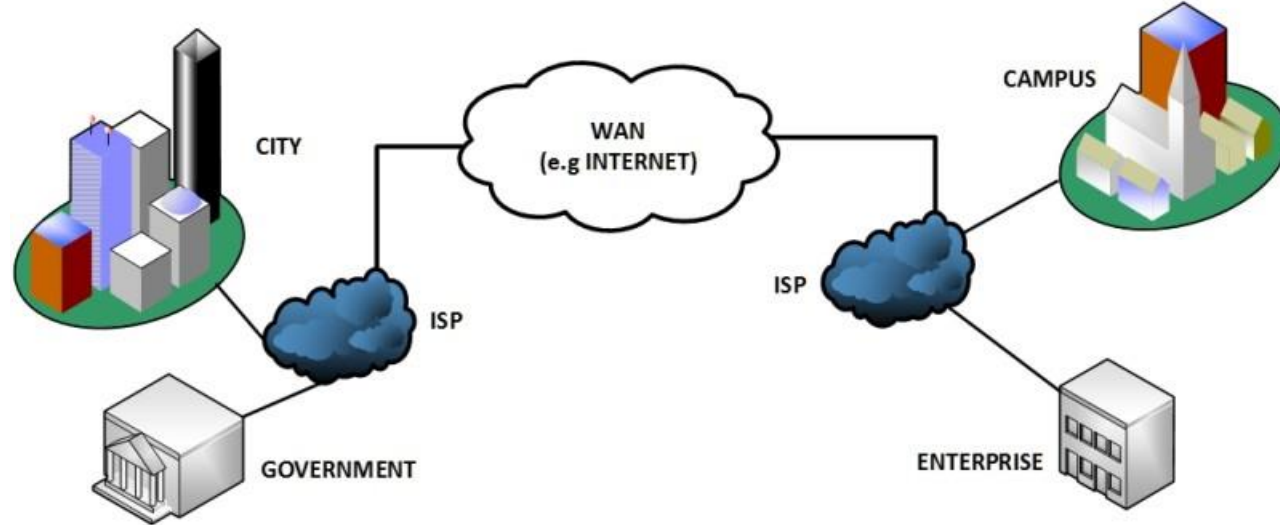
- The one of the two main categories of software.
- A software used to perform system tasks.
- A software supporting people to communicate and collaborate to accomplish work goals.

## B

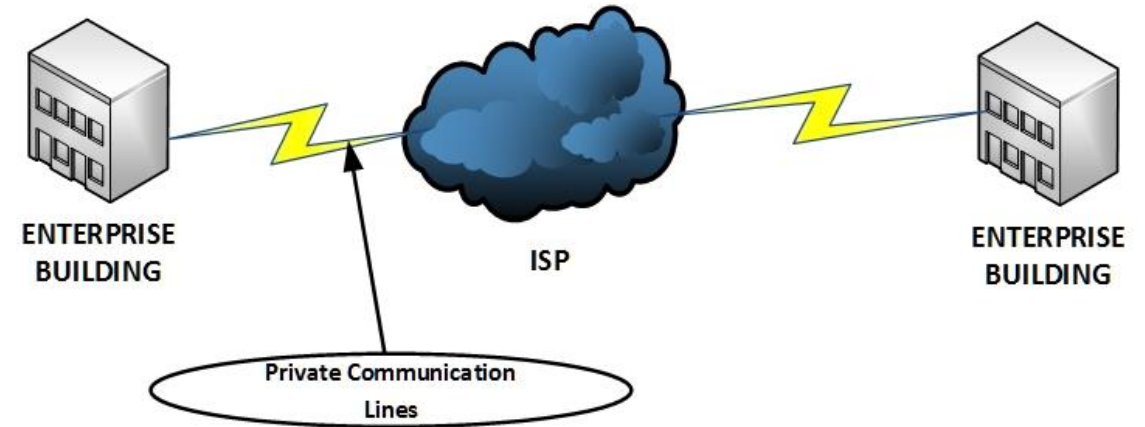
- Utility program
- Groupware
- System software

# IS Infrastructure: Networks

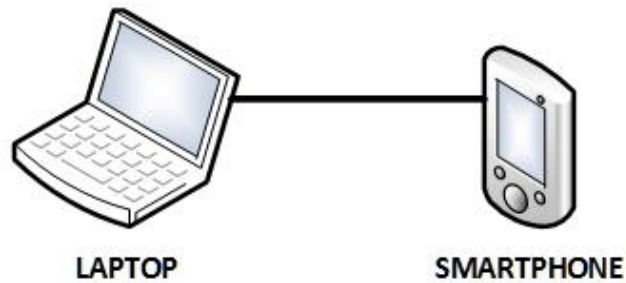
WIDE AREA NETWORK (WAN)



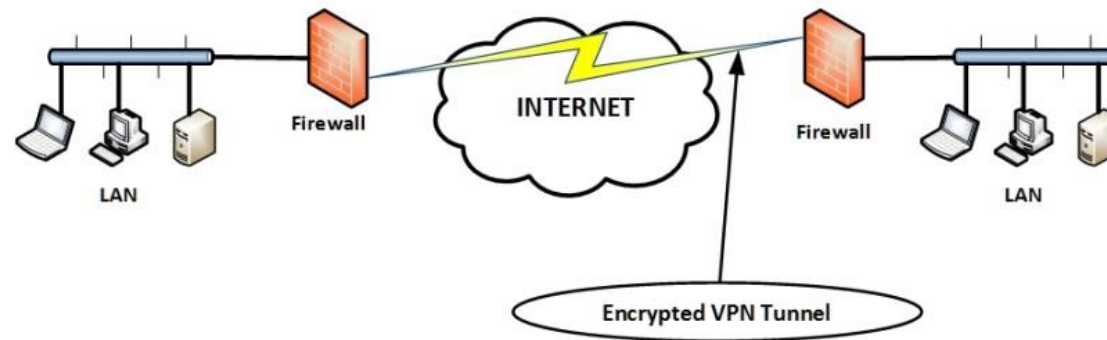
ENTERPRISE PRIVATE NETWORK



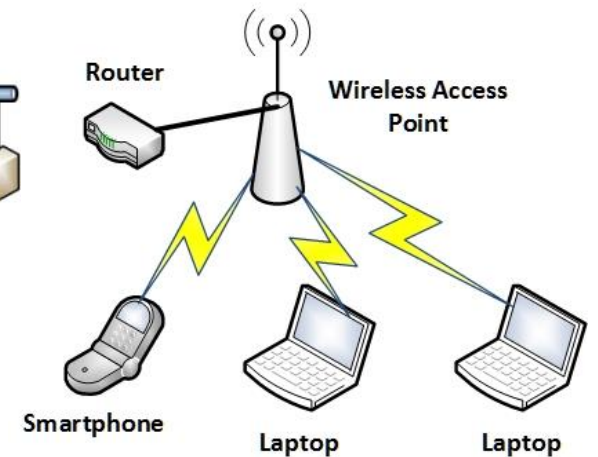
PERSONAL AREA NETWORK (PAN)



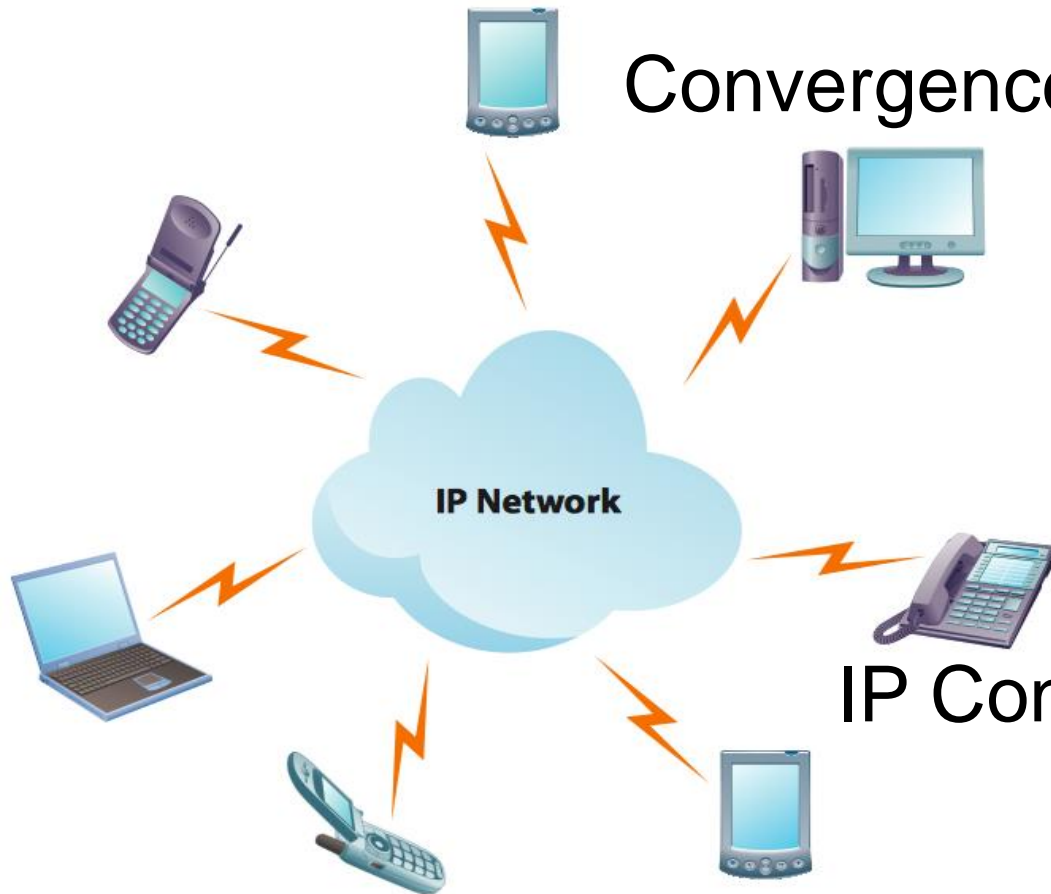
VIRTUAL PRIVATE NETWORK (VPN)



WIRELESS LOCAL AREA NETWORK (W-LAN)



# Communication and collaboration

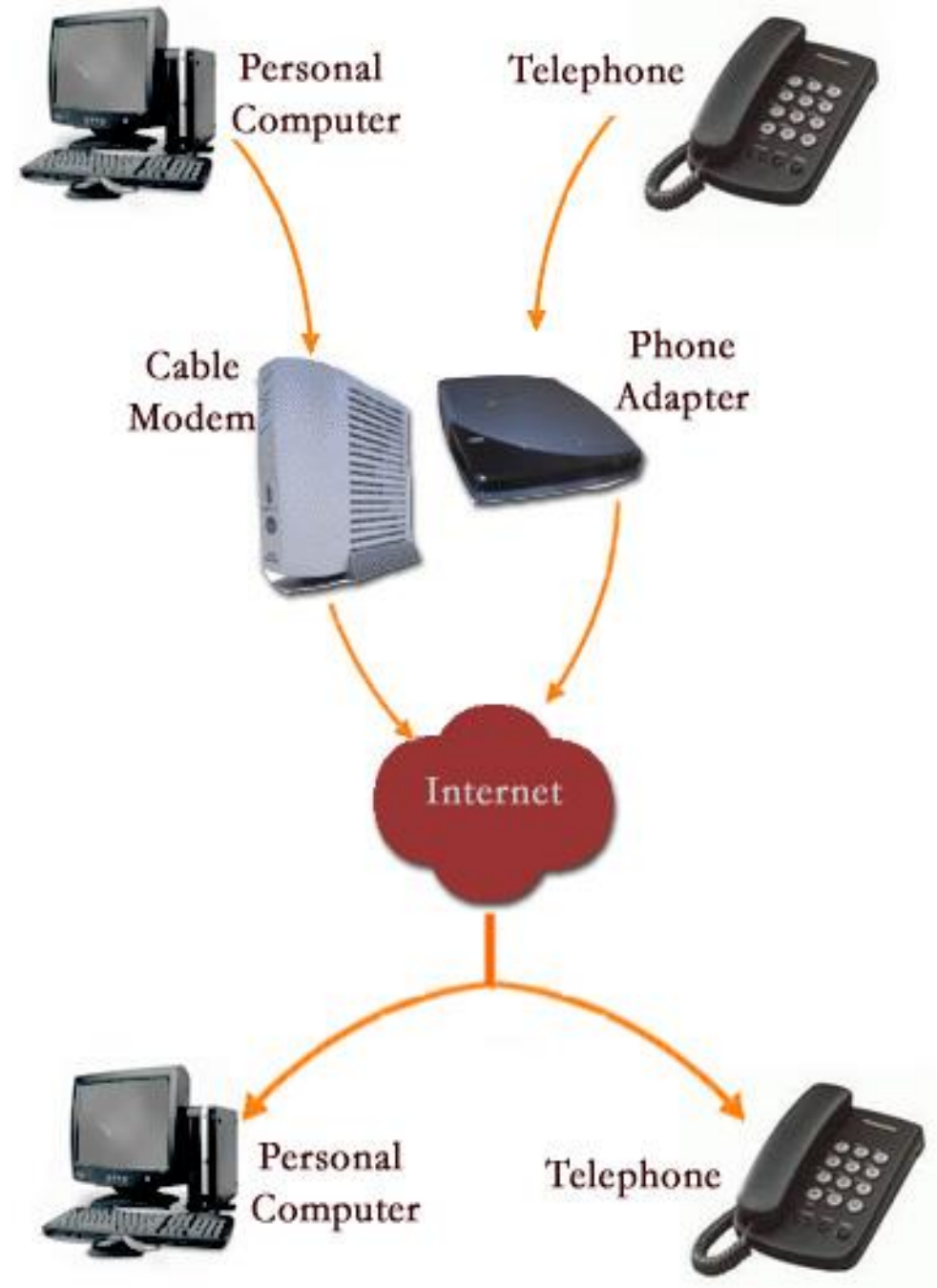


**Convergence of functionality:** Devices offer a variety of different functionalities

**IP Convergence:** Voice and data traffic shares a common network infrastructure

# Voice Over Internet Protocol (VoIP)

A technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line.  
e.g. Skype





# Video Conferencing

RingCentral Meetings

●●●●○ 4.0



Intermedia AnyMeeting

●●●●○ 3.5



Zoho Meeting

●●●●○ 3.0



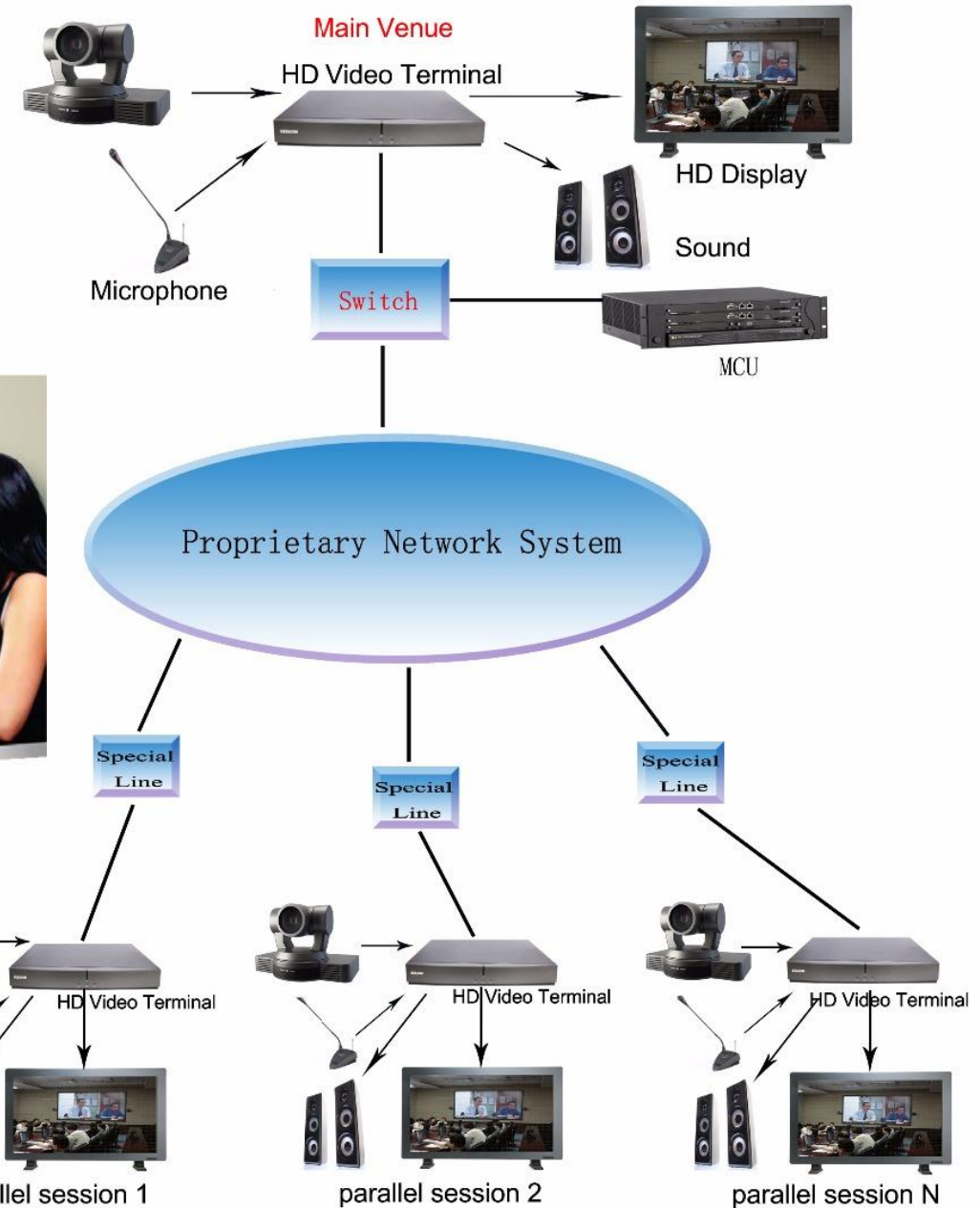
ClickMeeting

●●●●○ 4.5 EDITORS' CHOICE



Microsoft Teams

●●●●○ 4.0



# Wireless communication





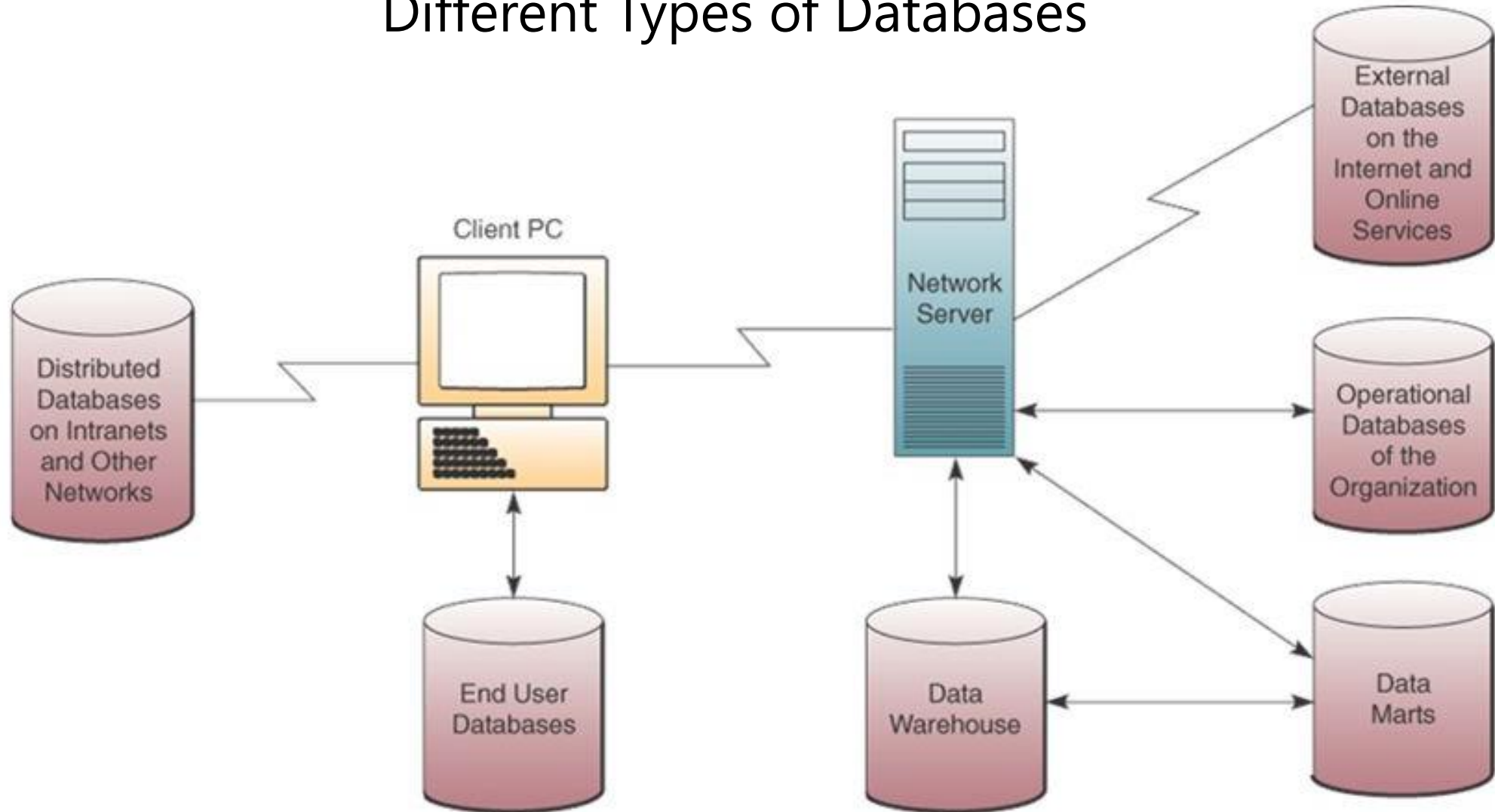
# Activity

## Fill in the blanks

- \_\_\_\_\_Technique for making telephone calls over the Internet.
- \_\_\_\_\_The ability for all networks to connect to one another.
- \_\_\_\_\_An interconnected or interrelated chain, group, or system.
- \_\_\_\_\_Software that serves to “glue together” separate programs.
- \_\_\_\_\_Internet-like networks that improve communications and collaboration, publish and share information, and develop applications to support business operations and decision making within an organization.
- \_\_\_\_\_A network to link the organization to the outside world in a manner that improves the way it does business.
- \_\_\_\_\_A company that provides individuals and organizations access to the Internet.
- \_\_\_\_\_A communications network covering a large geographic area.
- \_\_\_\_\_A communications network in an office, a building, or other work site.

# IS Infrastructure: Data Resources

## Different Types of Databases

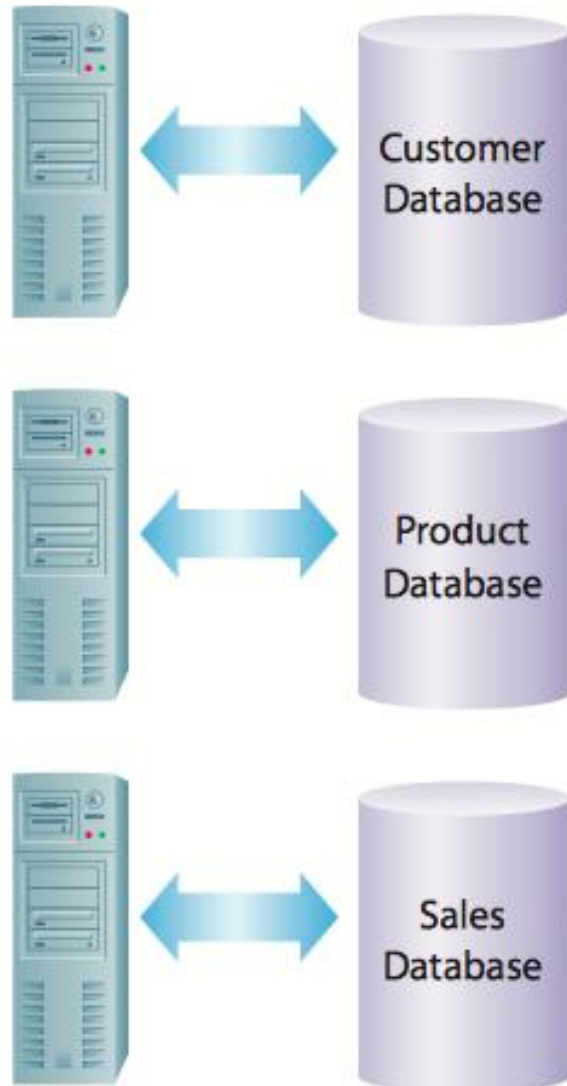


# Data Resources...Cond.

- To support business processes and gather business data
  - Online transaction processing (OLTP) systems
  - Online analytical processing (OLAP) systems
  - Transactional and analytical processing
    - **Operational systems** : Interact with customers and run a business in real time
    - **Informational systems** : support decision making based on stable point-in-time or historical data

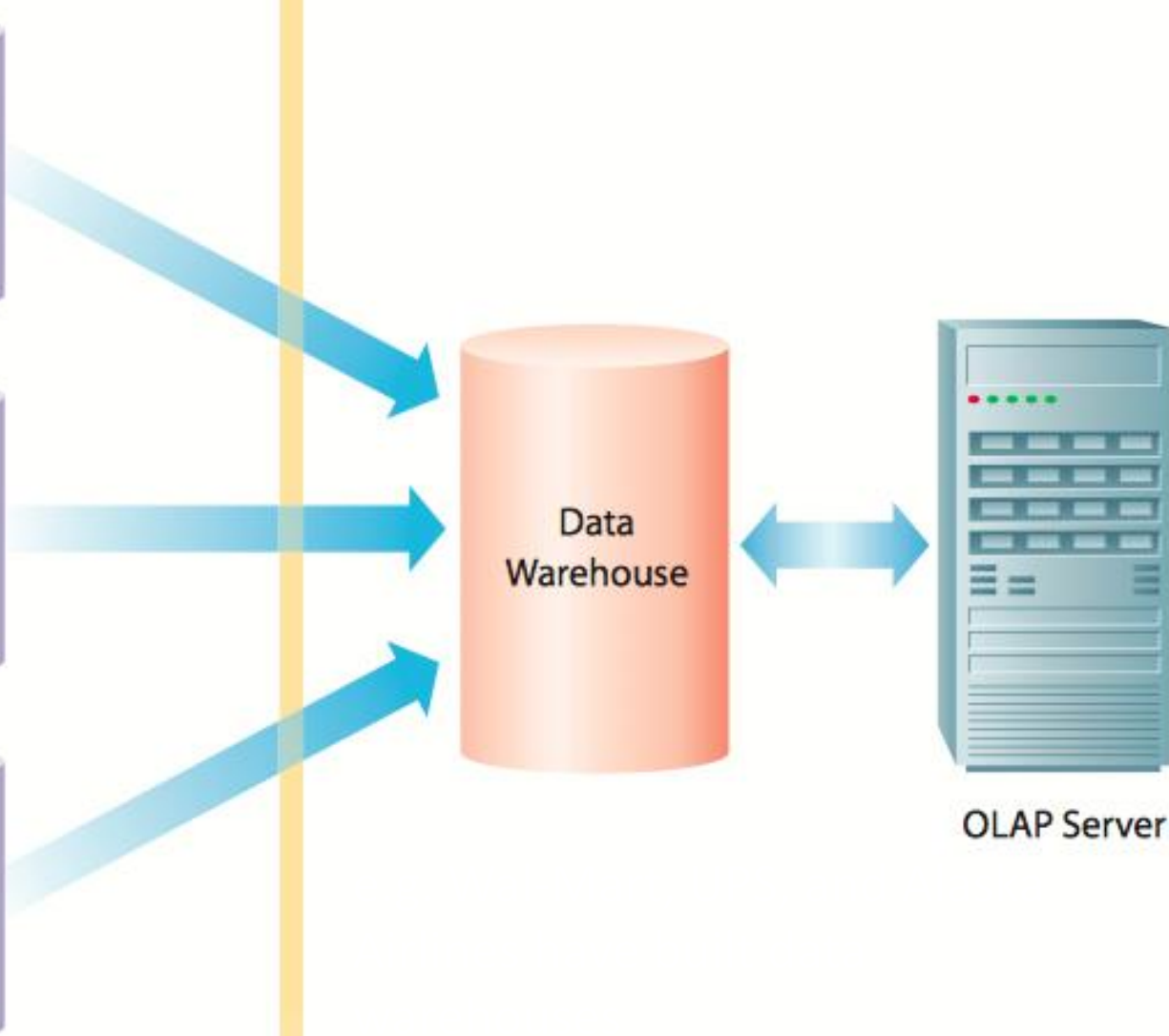
## Operational Systems

Information is gathered,  
processed, and updated

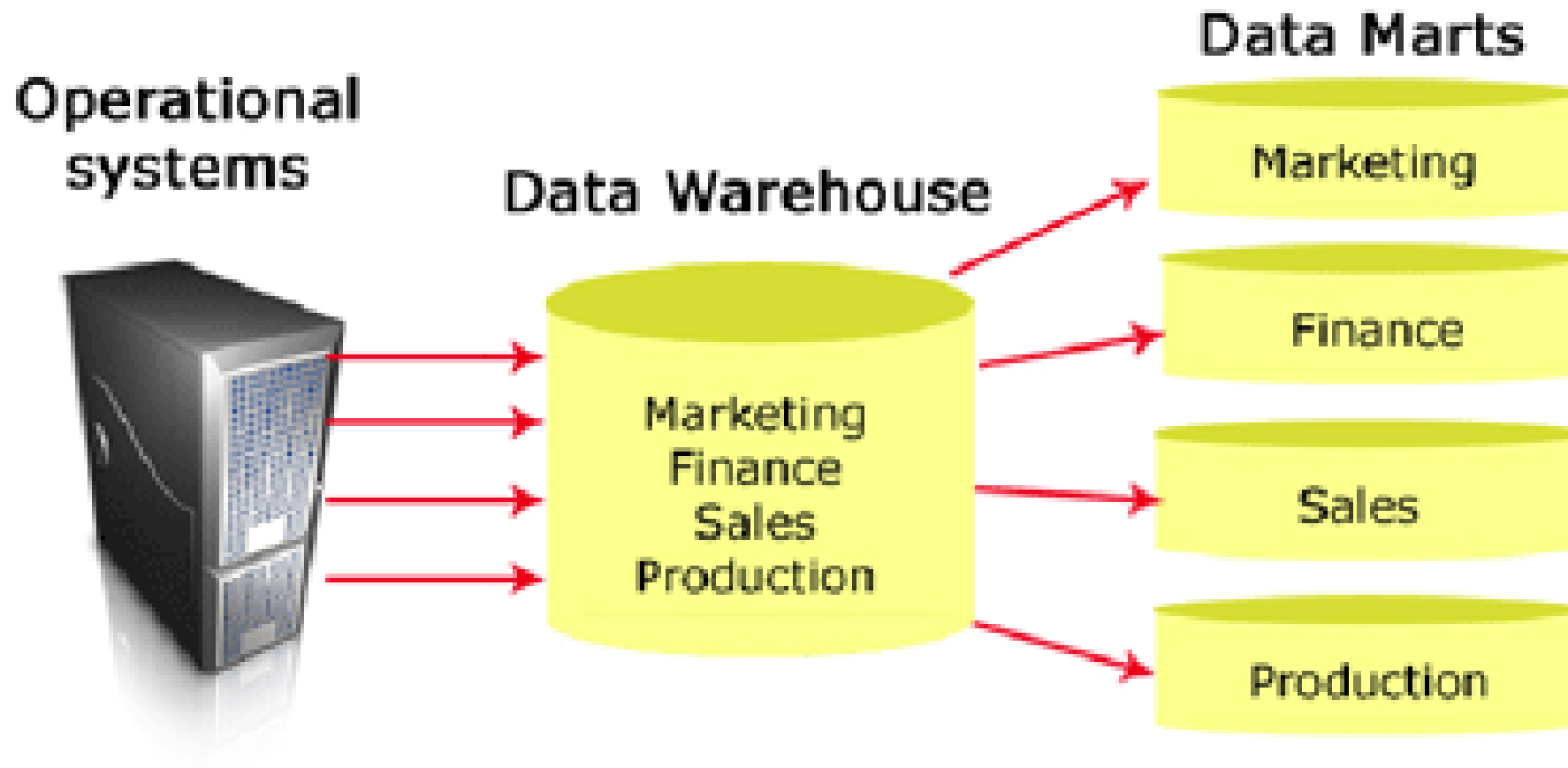


## Informational Systems

Information is analyzed



# Data Mart



# ACTIVITY

1. Discuss what utility computing is.
2. What's the difference between grid computing and cloud computing?
3. What's the difference between data warehouse and data mart?
4. Discuss pros and cons of using services of cloud computing.