IS101 Principles of Information Systems

Hardware and Software

Lecturer: Dr Maya Krayneva

Textbook: Stair, R., & Reynolds, G. (2016). Principles of information systems (13th ed.). Cengage Learning.

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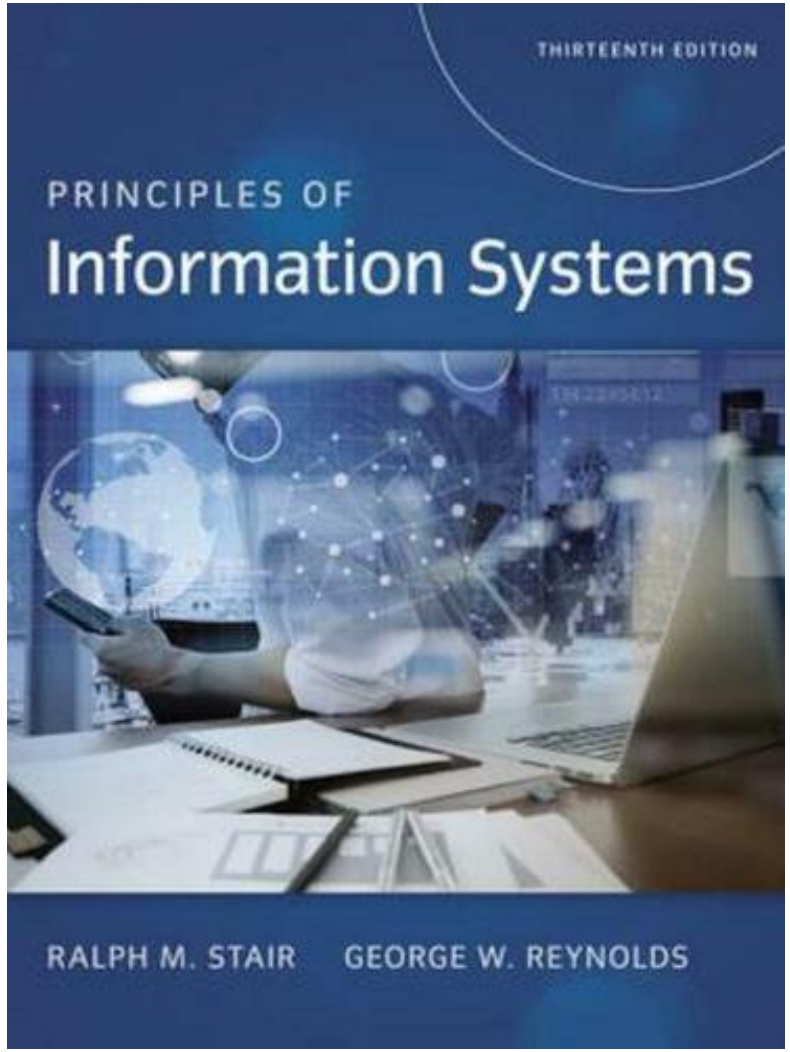
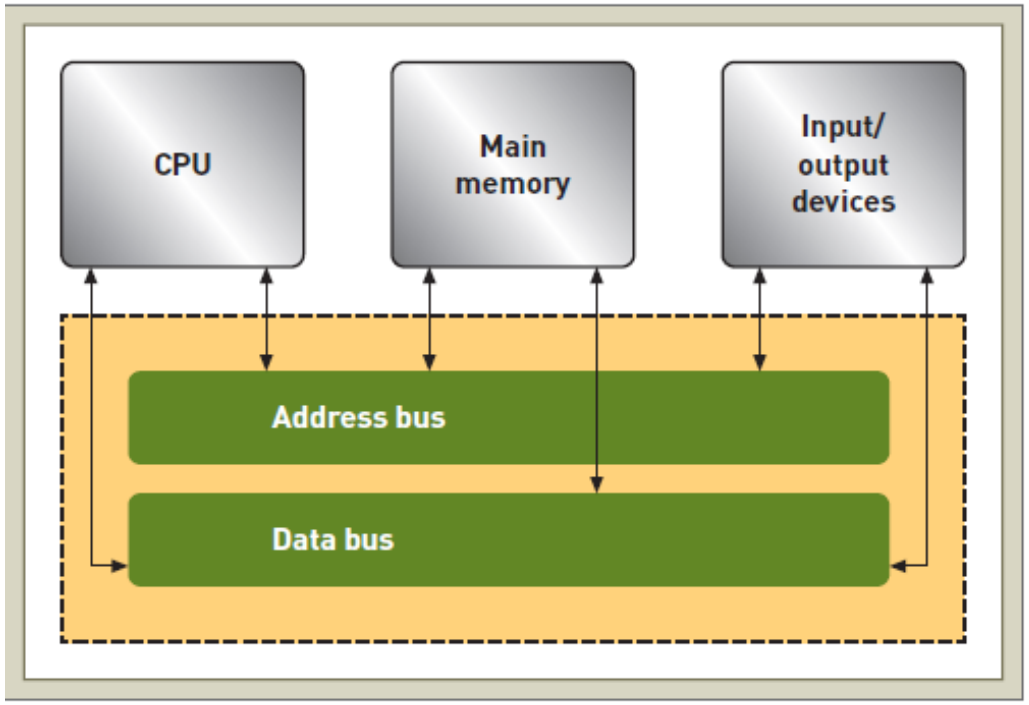


Chapter 3: Hardware and Mobile Devices

Principles of information systems

Thirteen Edition

Anatomy of a Computer

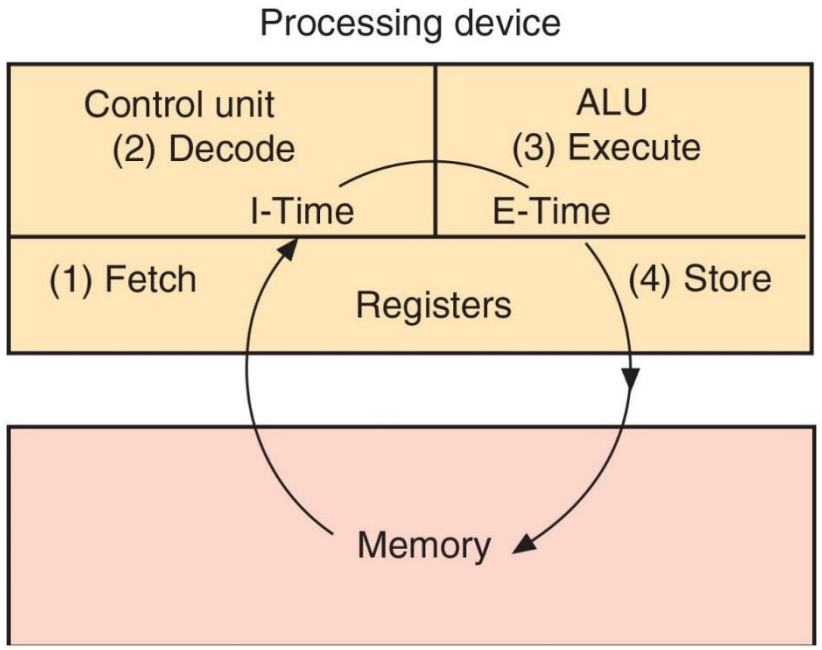


CENTRAL PROCESSING UNIT (CPU): Part of the computer that ***sequences*** and ***executes*** **instructions**

MEMORY:

- Main Memory: Provides the processor with a **working storage** area to hold program ***data*** **and** ***instructions***
- Random access memory (RAM): stores instructions or data temporarily
- Cache memory: High-speed memory, processor can access more rapidly than main memory
- Read-only memory (ROM): Nonvolatile memory

INPUT/OUTPUT DEVICES: Provide **data and instructions** to the computer and receives **results** from it



Data **Processing** steps

Involves two phases (instruction and execution), which are broken down into four steps:

- The **instruction** phase
  - Step 1: fetch instruction
  - Step 2: decode instruction
- The **execution** phase
  - Step 3: execute instruction
  - Step 4: store results

Processing

Multiprocessing

- Simultaneously execute two or more instructions

Parallel processing

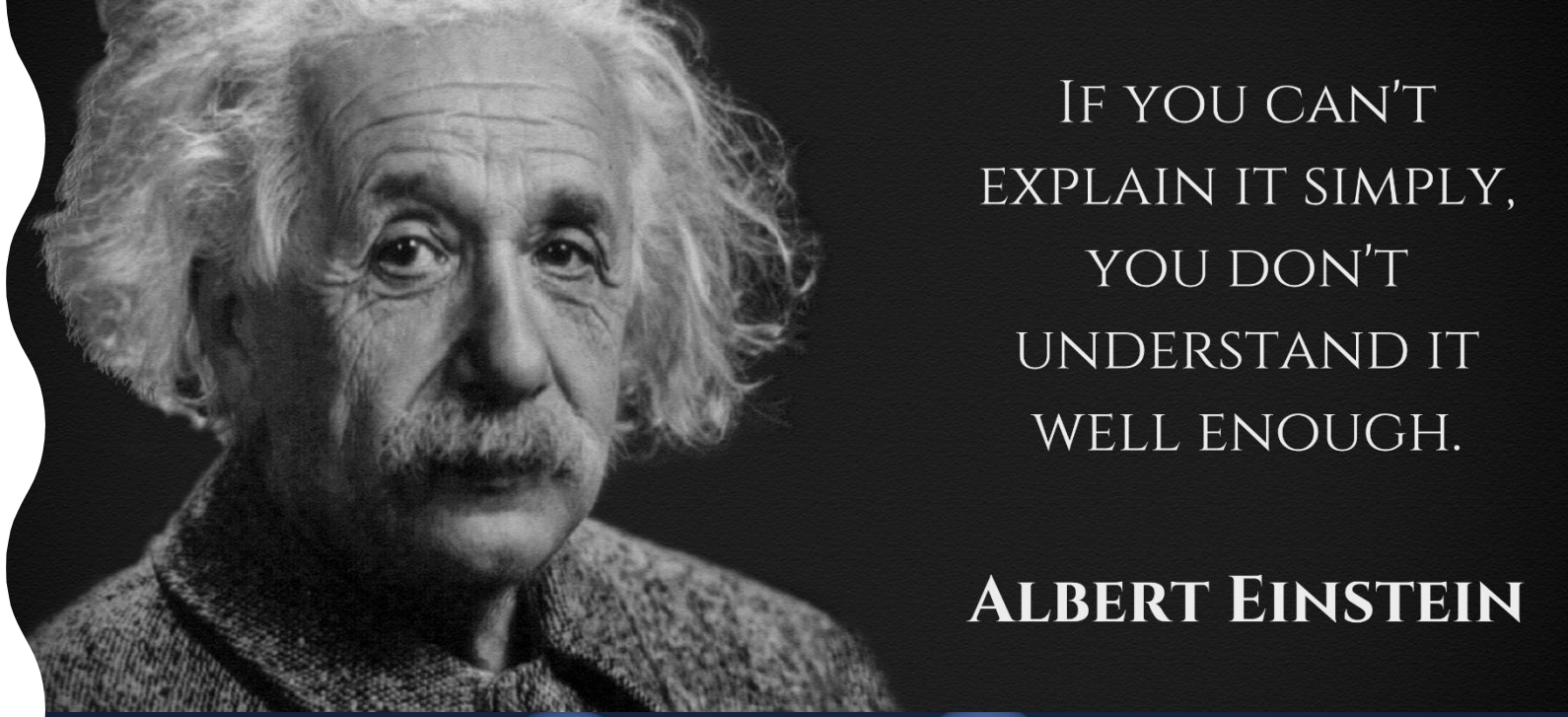
- Simultaneously execute the same task on multiple processors

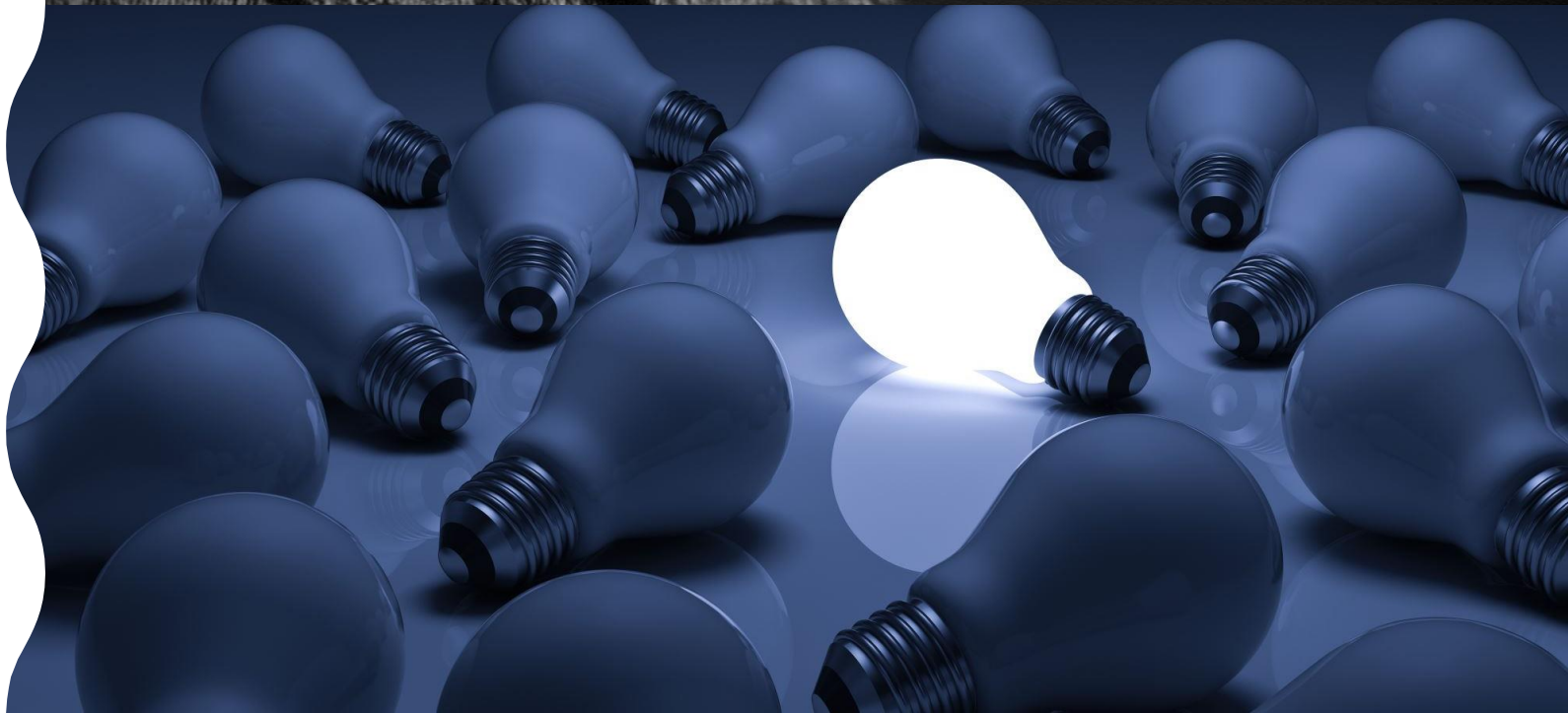
Grid computing

- Solves a common problem
  - Divides computing task into subtasks
  - Assigns work to grid computers
  - Monitors processing

- Imagine the Information System solution (you proposed for your business) is successfully implemented and fully functioning. Congratulations!

- Using your solution as an example, illustrate what is happening in each of the 3 computer components (CPU, memory and input/output devices).





Secondary Data Storage

Computers usually use input/output channels to access secondary storage and then transfer the desired data to intermediate areas in primary storage

Most common **forms**:

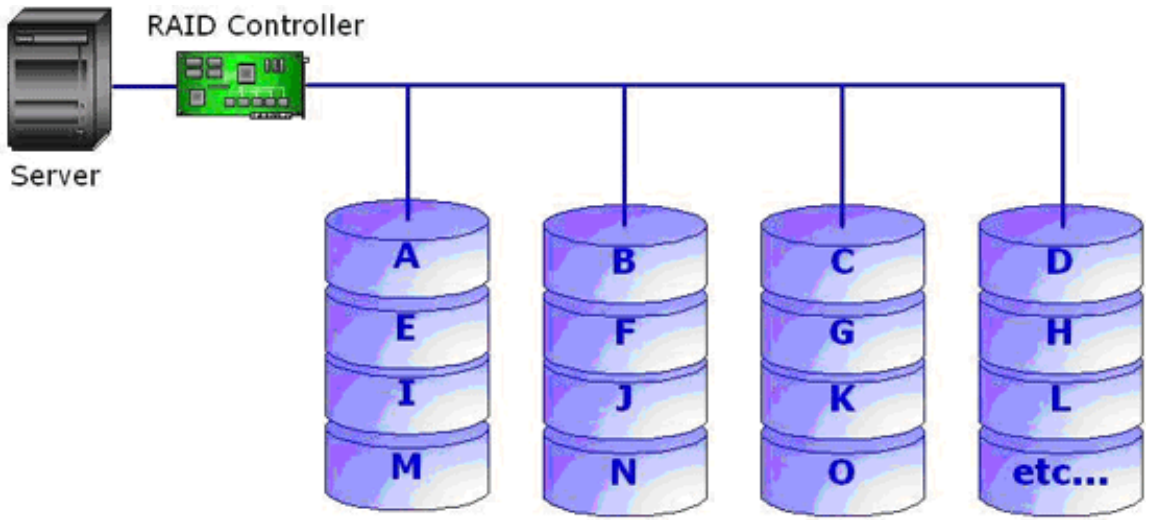
1. Magnetic (e.g. magnetic tape))

2. Optical – use of lasers (e.g. Compact disc read-only memory (CD-ROM), Digital video disk (DVD), Blu-ray high-definition video disk)

3. Solid state (Memory chips such as USB)

ROBOTIC TAPE BACKUP SYSTEM

The national center for atmospheric research uses a **robotic tape backup system** to back up a fleet of supercomputers that solve the world's most computationally intensive climate-modeling problems.



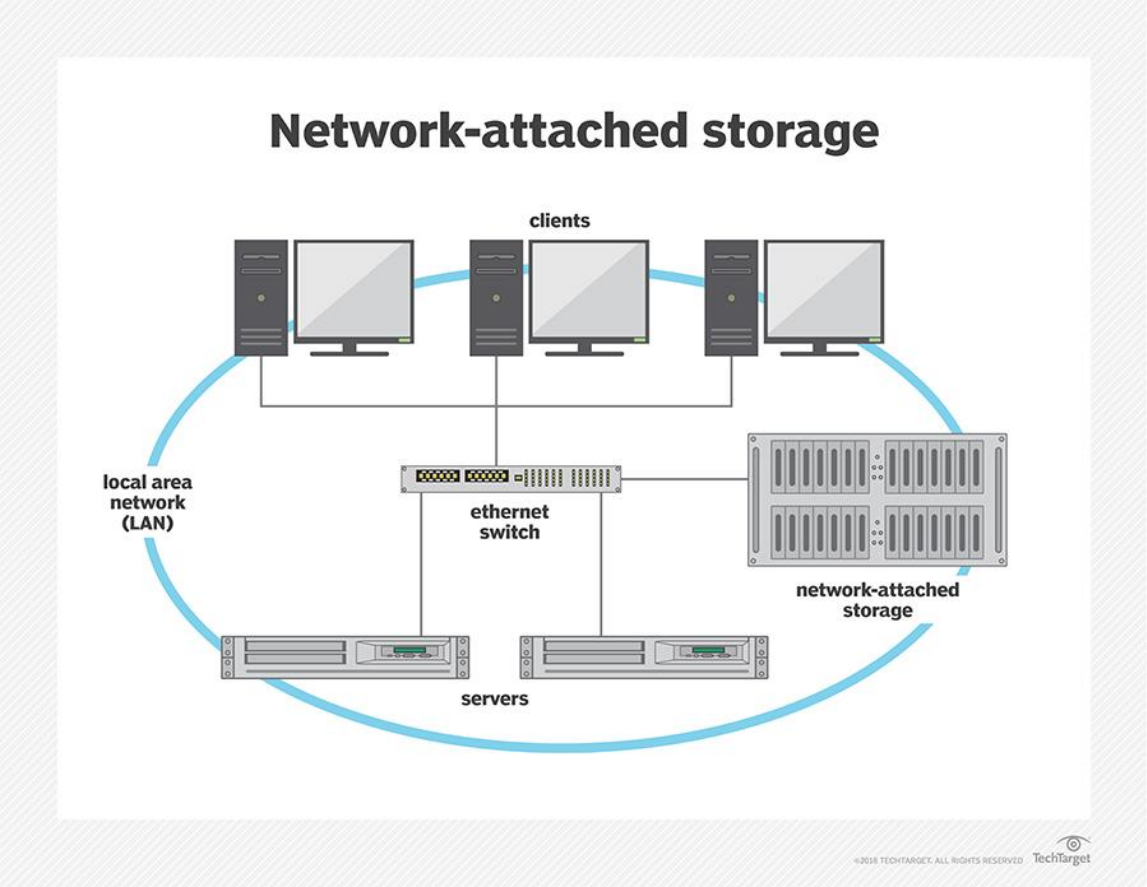
Most common **forms**:

1. Magnetic
2. Optical
3. Solid state

+ Redundant array of independent/inexpensive disks (RAID): same data on multiple hard discs, mainly used for data protection (e.g. mirroring)

+ Virtual tape: as if stored on a tape (but stored on a hard drive)

Enterprise storage: large secondary storage



1. ATTACHED STORAGE (devices connected **directly** to a single computer)

2. NETWORK-ATTACHED STORAGE (NAS): A **hard disk drive storage device** that is set up with its own network address and provides file-based storage services to other devices on the network

3. CLOUD COMPUTING STORAGE

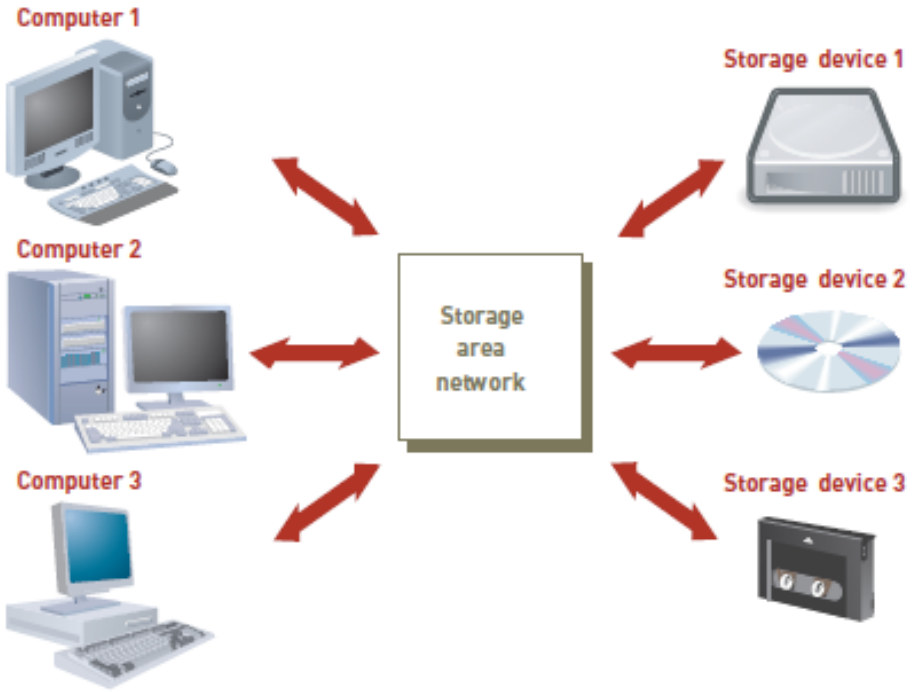
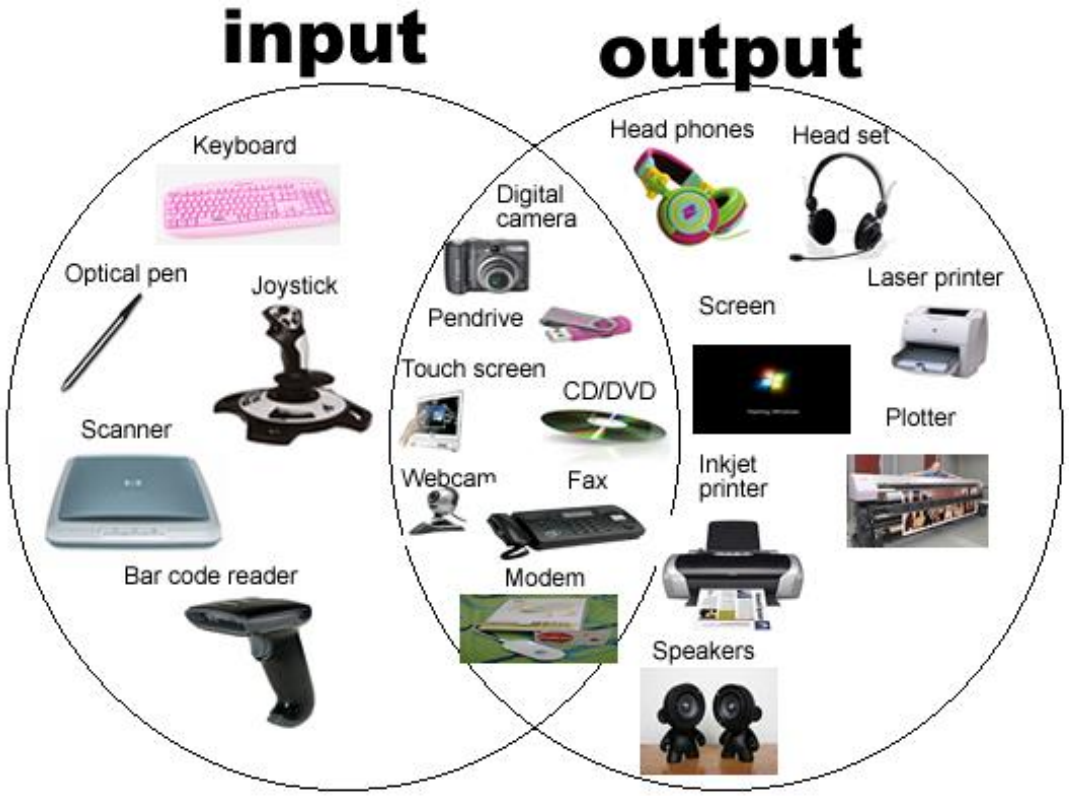


FIGURE 3.7
Storage area network
A SAN provides high-speed connections among data storage devices and computers over a network.

Forms of enterprise storage (continued):

4. STORAGE AREA NETWORKS (SANS): A high-speed, special-purpose network that integrates **different types of data storage devices** into a **single storage system** and connects that to computing resources across an entire organization

Input and Output Devices



Input and output devices: Allow the user to **provide** data and instructions to the computer and to **receive** results from it

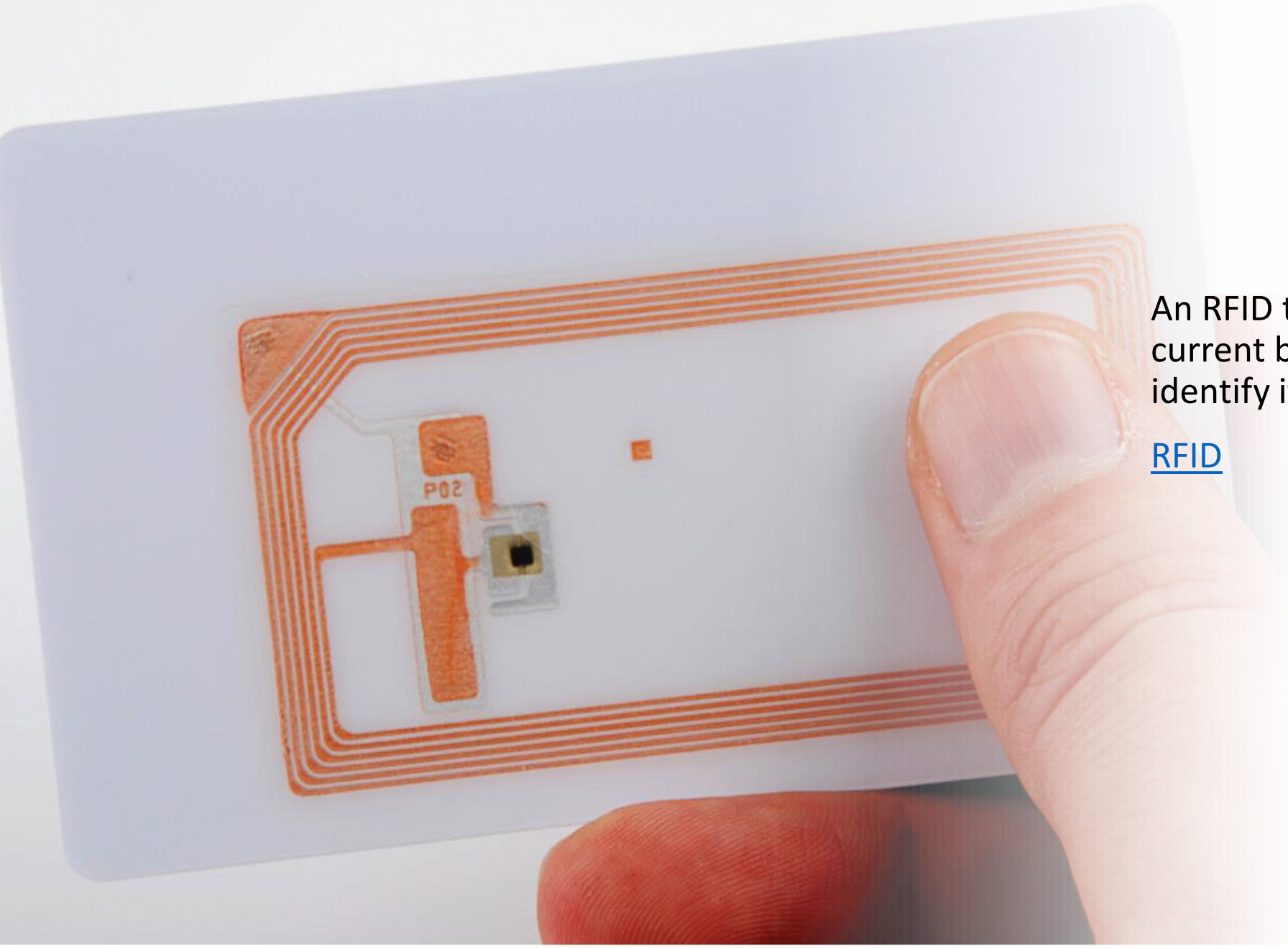
Desired characteristics

- Input devices: allow accurate and rapid entry
- Output devices: produce timely results

Input Devices

- Common Personal Computer Input Devices: Keyboard and mouse
- Speech-Recognition Technology
- Motion-Sensing Input Devices
- Scanning Devices
- Optical Data Readers
- Magnetic Ink Character Recognition (MICR) Devices
- Magnetic Stripe Cards
- Chip Cards
- Smart Cards
- Contactless Payment Cards
- Point-of-Sale (POS) Devices
- Automated Teller Machine (ATM) Devices
- Bar-Code Scanners
- Radio Frequency Identification (RFID) Devices
- Pen Input Devices
- Touch Screens

A drawing pad and integrated keyboard can replace a traditional keyboard and mouse for input.



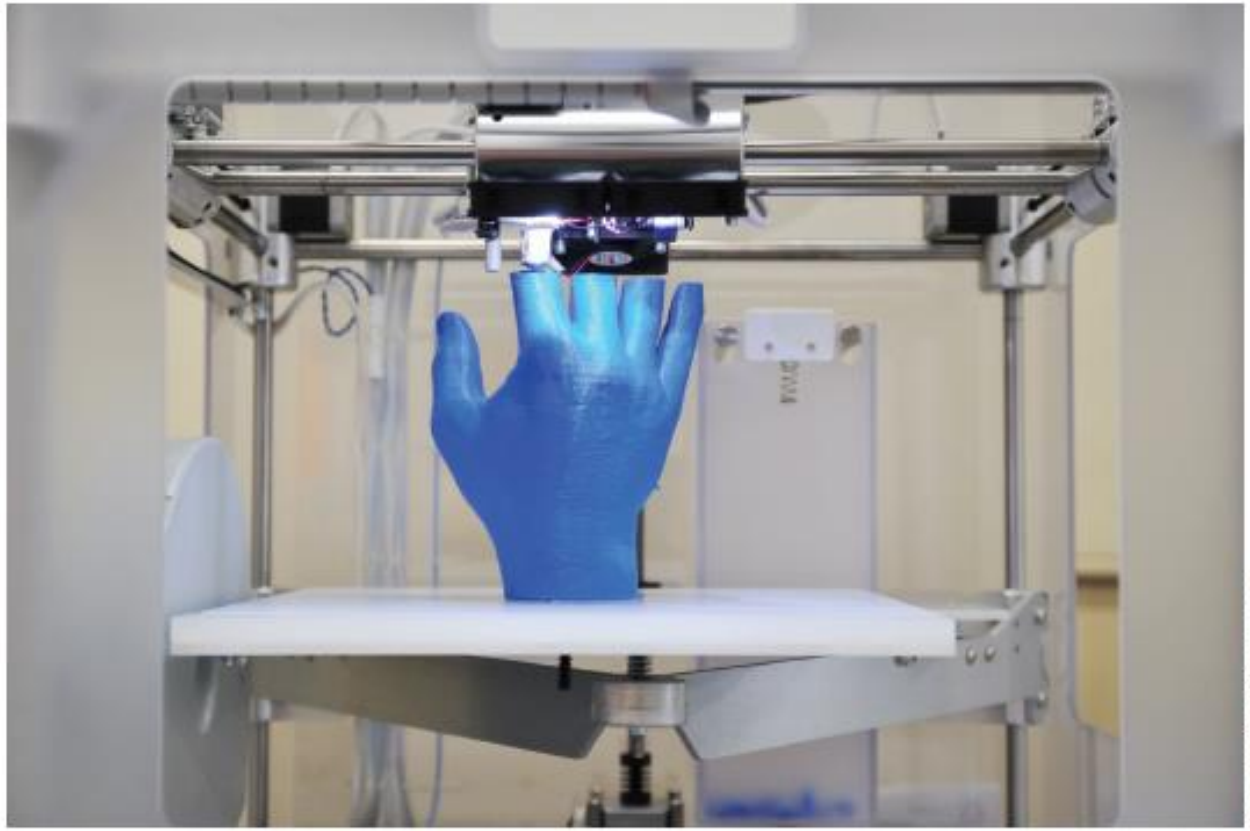
An RFID tag is small compared with current bar-code labels used to identify items.

RFID

Output Devices

- Display Screens
- Printers and Plotters
- 3D Printers

  E.g. Bioprinting: Uses 3D printers to build human parts and organs from actual human cells
- Digital Audio Players
- E-Book Readers



dreamnikonv/iStock/Getty Images

FIGURE 3.11
3D printer
3D print technology is making it possible to print objects ranging from everyday objects to houses.

3D print technology

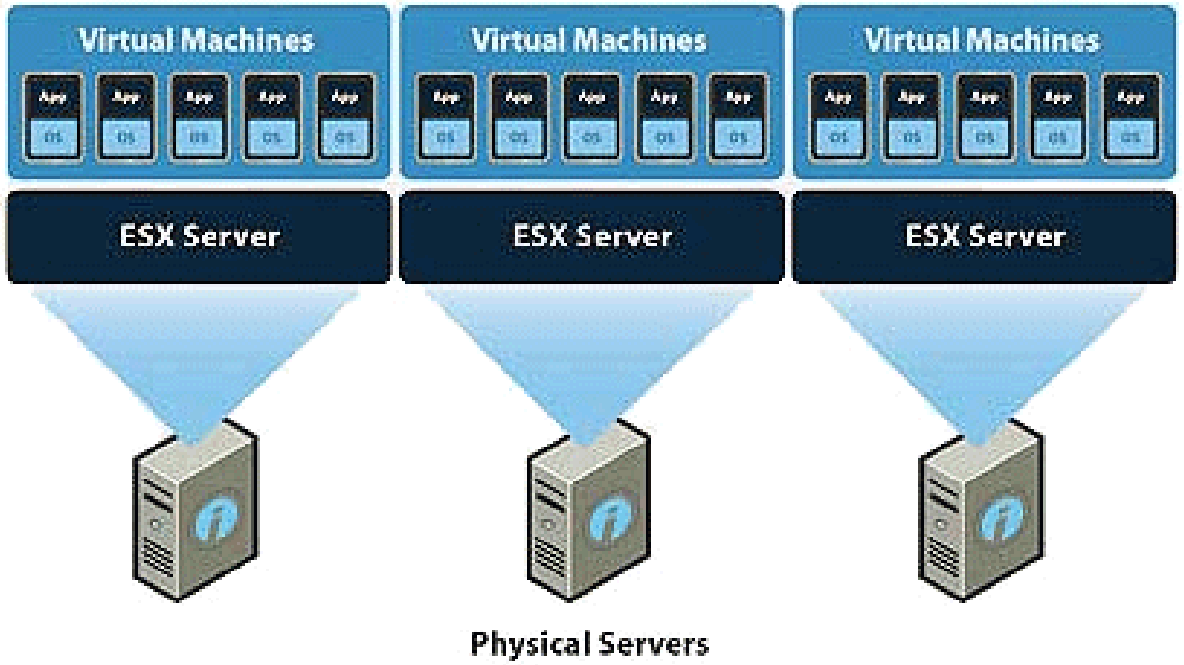
4D printing

Servers

- Server: A computer employed by many users to perform a **specific task**, such as running network or Internet applications

- Server farm: a **room** used to house a large number of servers

- Virtual server: a method of **logically dividing** the resources **of a single** physical server to create multiple logical servers



Servers (continued)

BLADE SERVER: a server that houses **many** individual computer **motherboards**

Rank	Name	Where Deployed	Location	Speed (Petaflops) Measures
1	Summit	Oak Ridge National Laboratory (ORNL)	Oak Ridge, TN, United States	122.3
2	Sunway TaihuLight	National Supercomputing Center	Wuxi, China	93
3	Sierra	Lawrence Livermore National Laboratory	Livermore, CA, United States	71.6
4	Tianhe-2A	National Supercomputing Center	Guangzho, China	33.9
5	AI Bridging Cloud Infrastructure (ABCI)	National Institute of Advanced Industrial Science and Technology (AIST)	University at Shinagawa, Tokyo, Japan,	19.9

Five most powerful operational supercomputers (June 2018)

Summit

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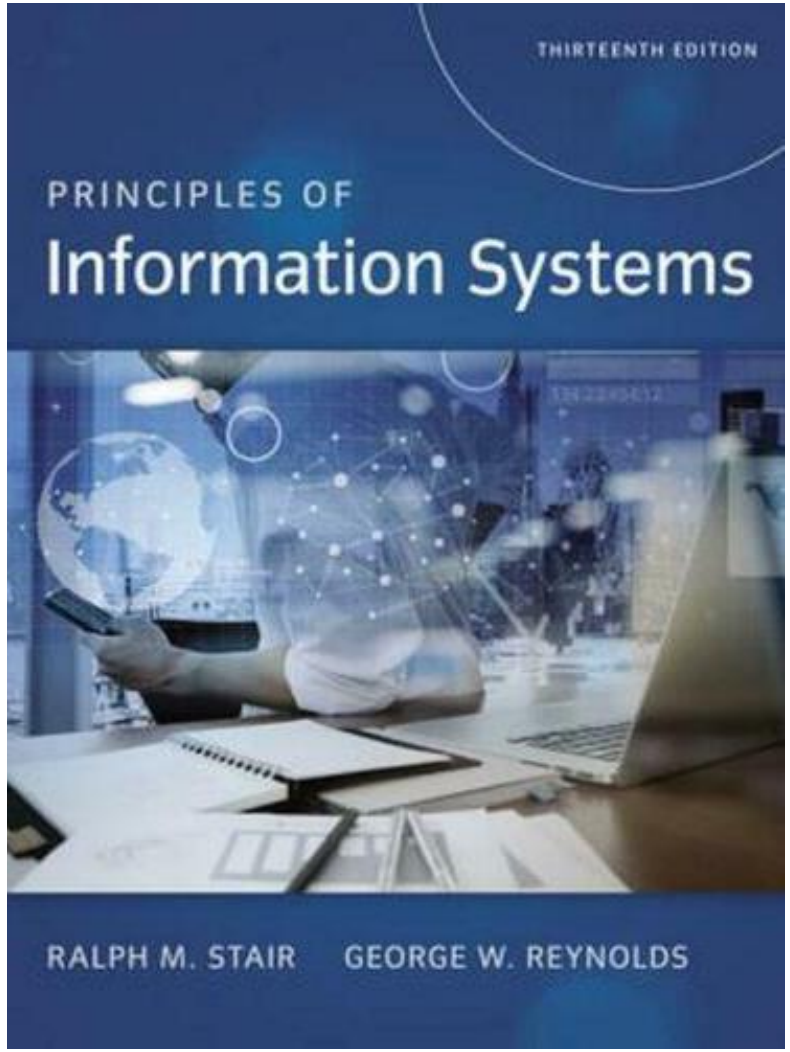

Chapter 4: Software and Mobile Applications

Principles of information systems

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System versus Application Software

- Software: Consists of computer programs that control the workings of computer hardware

Software can be divided into two types:

1. **System software** – includes:
   a. operating system (OS),
   b. utilities, and
   c. middleware that coordinate the activities and functions of the hardware and other programs

2. **Application software** – programs that help users solve particular computing problems

TABLE 4.1 Software supporting individuals, workgroups, and enterprises

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

1. System software

a. Operating Systems

Operating systems: A set of programs that controls computer hardware and acts as an **interface with application programs**

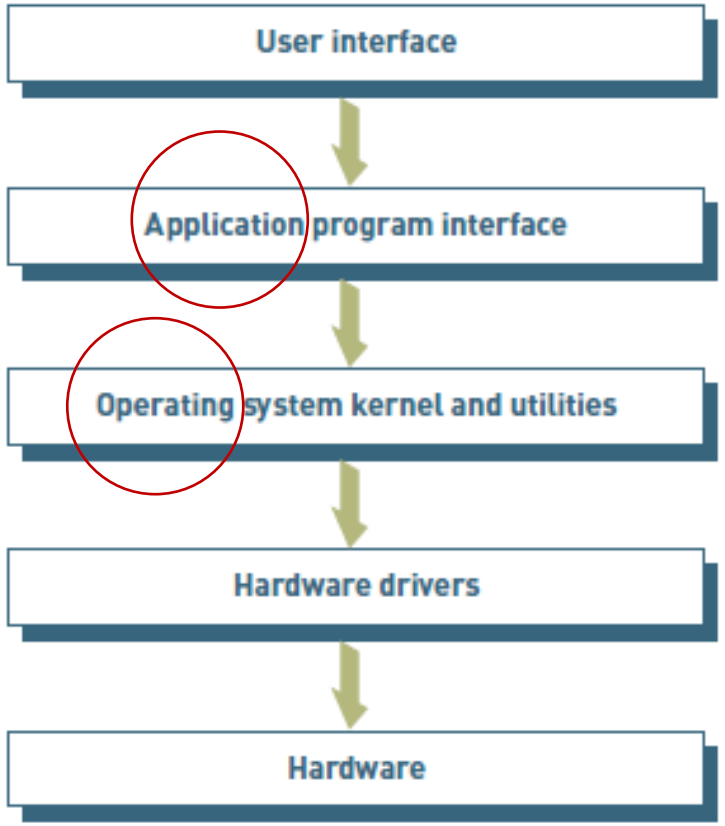


FIGURE 4.3
Role of operating systems
The role of the operating system is to act as an interface between application software and hardware.

Interfaces

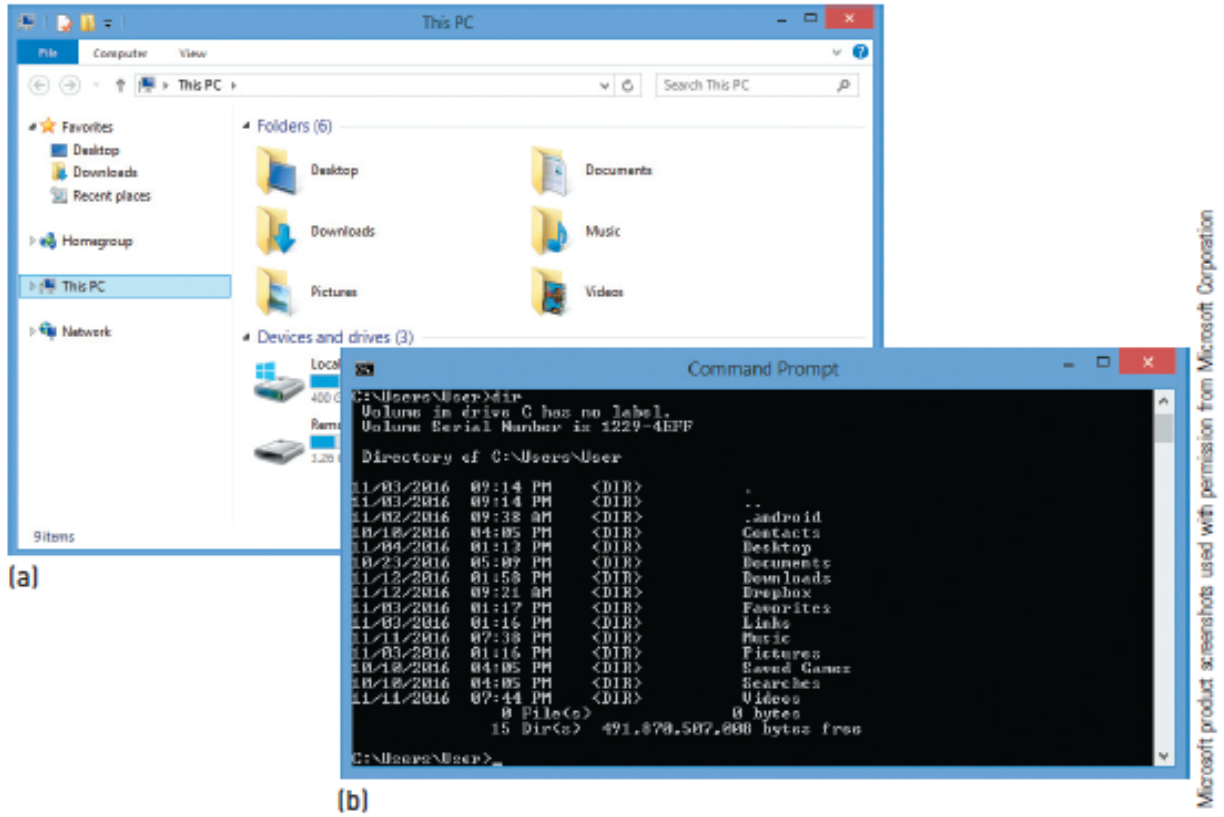


FIGURE 4.4

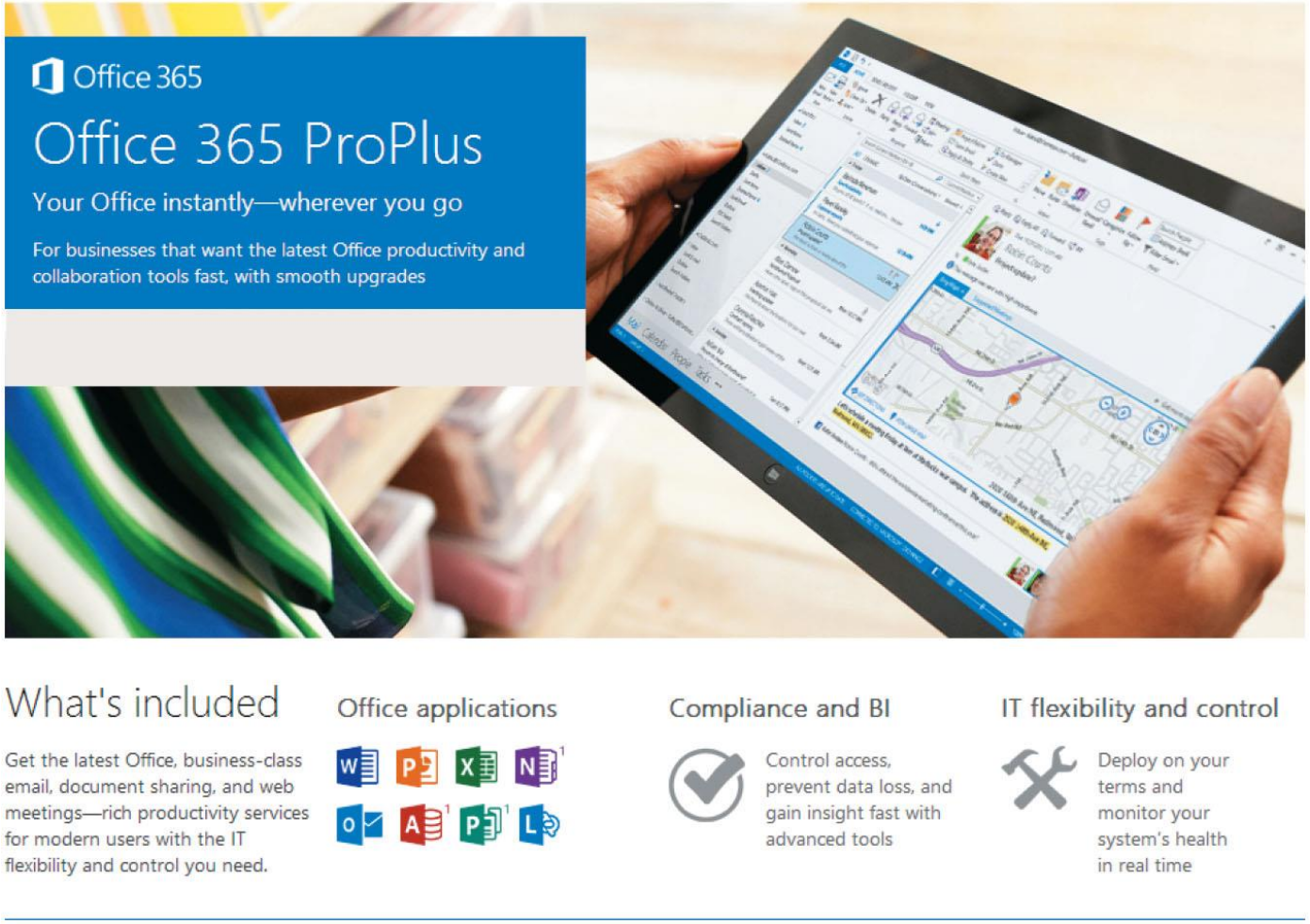
Command-based and graphical user interfaces

A Windows file system viewed with a GUI (a) and from the command prompt (b).

Software Suites and Integrated Software Packages

Personal Productivity Function	Microsoft Office	Corel WordPerfect Office	Apache OpenOffice	Apple iWork	G Suite (Google Apps)
Word processing	Word	WordPerfect	Writer	Pages	Docs
Spreadsheet	Excel	Quattro Pro	Calc	Numbers	Sheets
Presentation graphics	PowerPoint	Presentations	Impress and Draw	Keynote	Slides
Database	Access	Paradox	Base	N/A	N/A

Major components of leading software suites



Office 365 software **as a Service**

Microsoft office 365 is a web-based application suite that offers basic software suite features over the internet using **cloud computing**.

b. Utility Programs

Utility program: a program that helps to perform **maintenance** or **correct** problems with a system

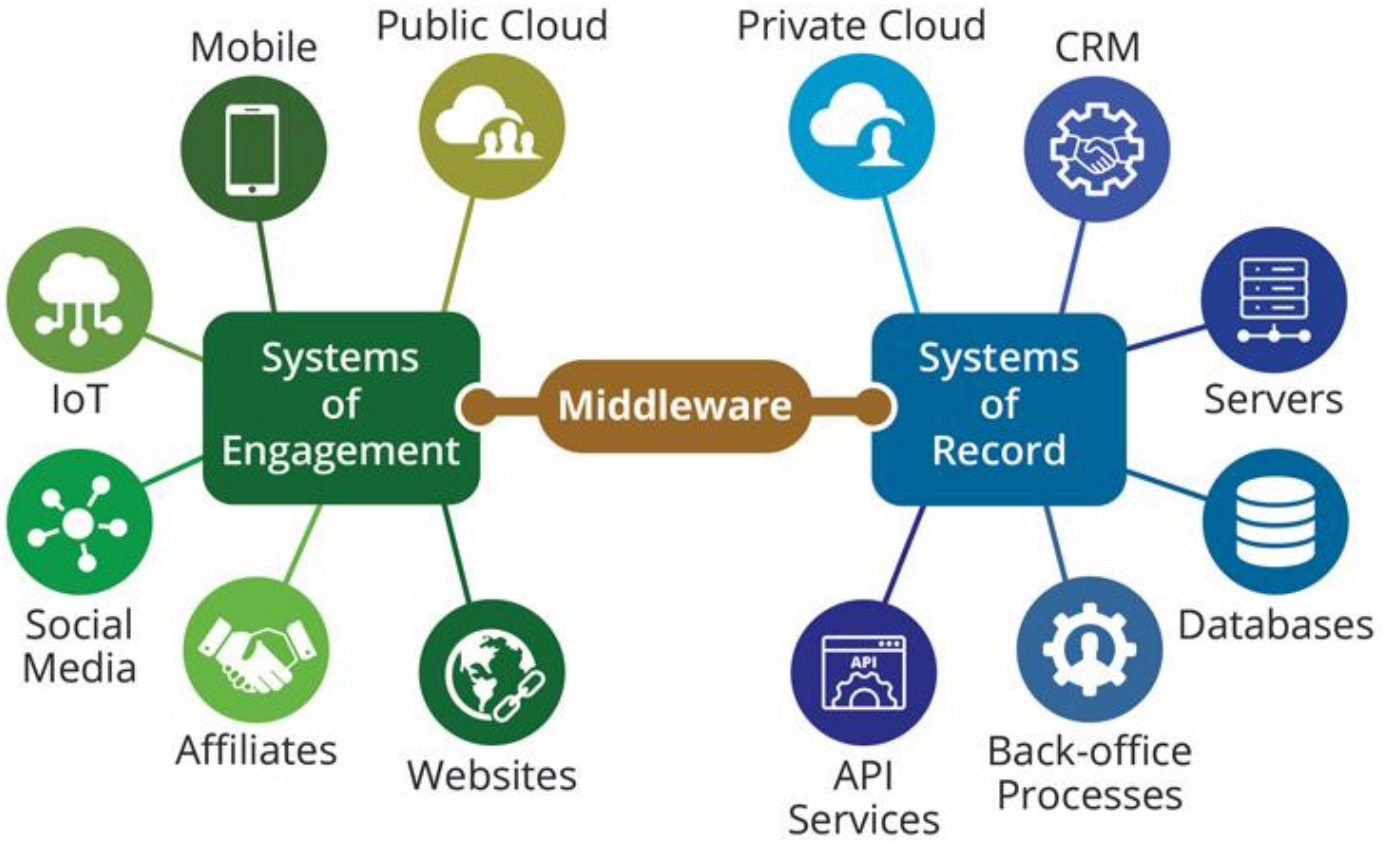
Examples:

- Hardware utilities
- Security utilities
- File-compression utilities
- Spam-filtering utilities
- Network and Internet utilities
- Server and mainframe utilities

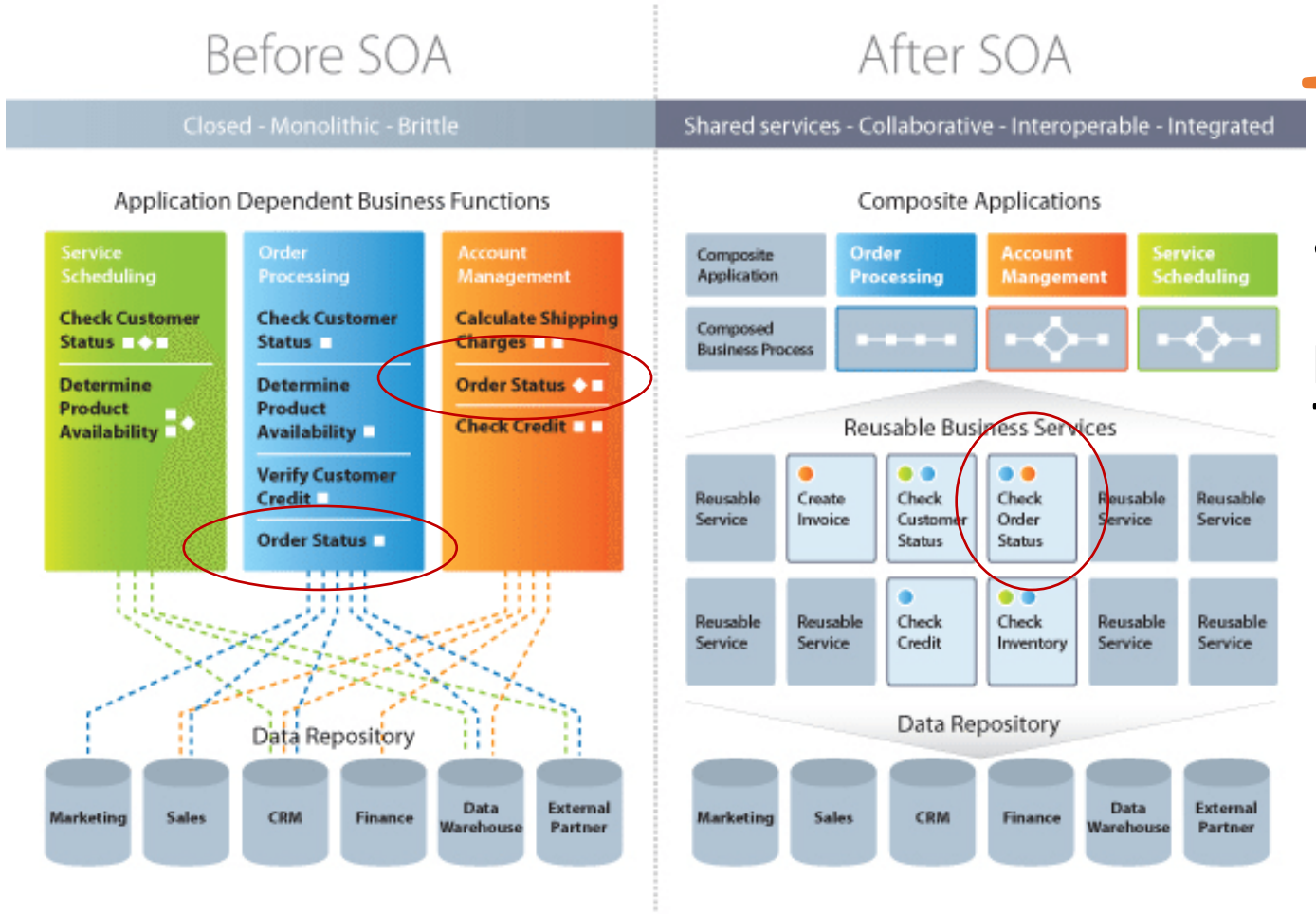
c. Middleware

Middleware: Software provides messaging services and allows **different systems** (and their applications) to **communicate** and **exchange data;** lies **between OS and applications** running on it

Middleware made simple



Service-oriented architecture (SOA)



a software design approach using discrete **modules** to **provide specific functions to applications**

2. Application Software

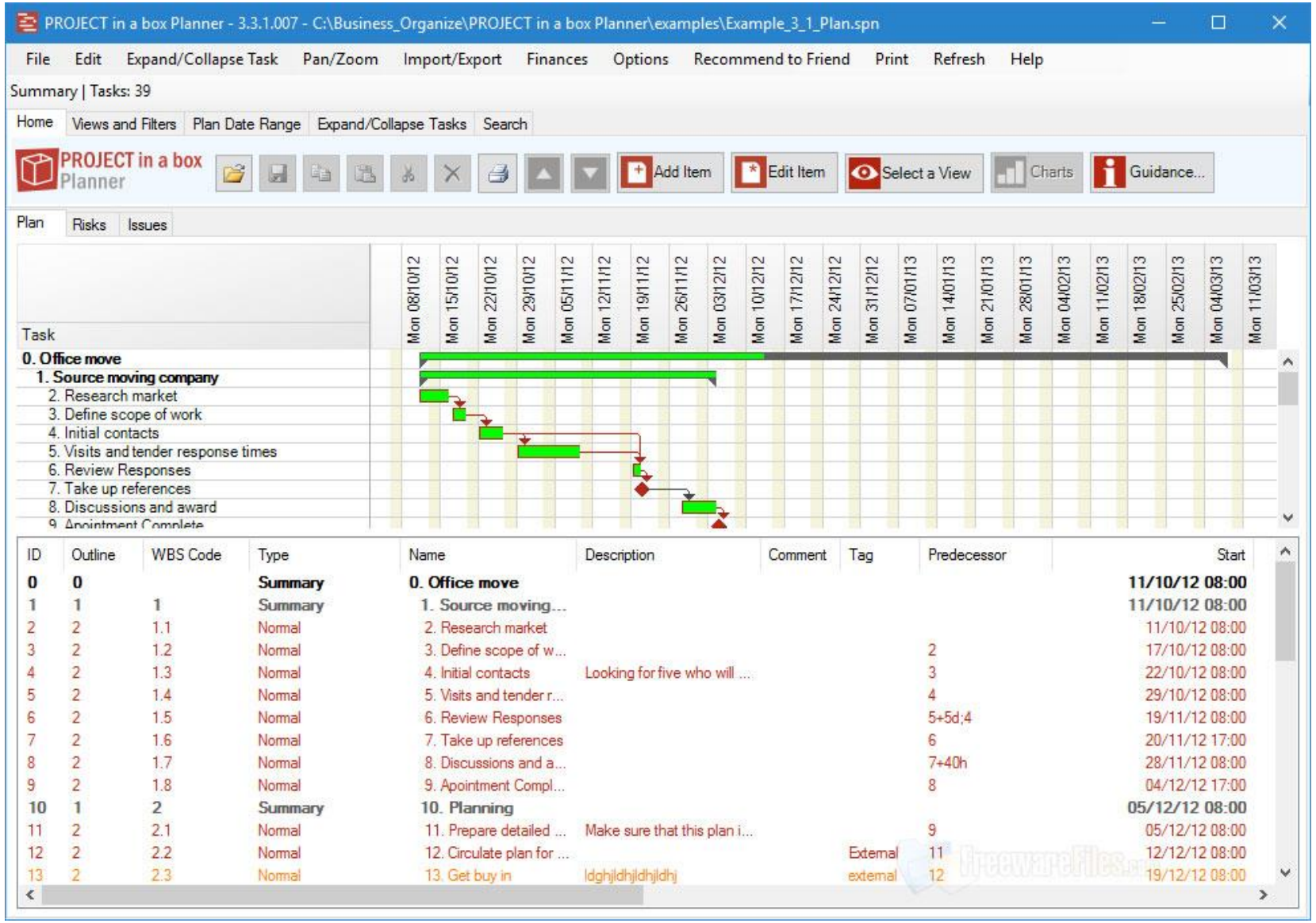
a. Custom (or Proprietary) software: a **one-of-a-kind** program for a specific application

- Owned by the company, organization, or person that uses it

b. General purpose (or Off-the-shelf) software: software **mass-produced** by software vendors

- Needs that are common across businesses, organizations, or individuals

Application software example : *PROJECT in a box*



Programming Languages

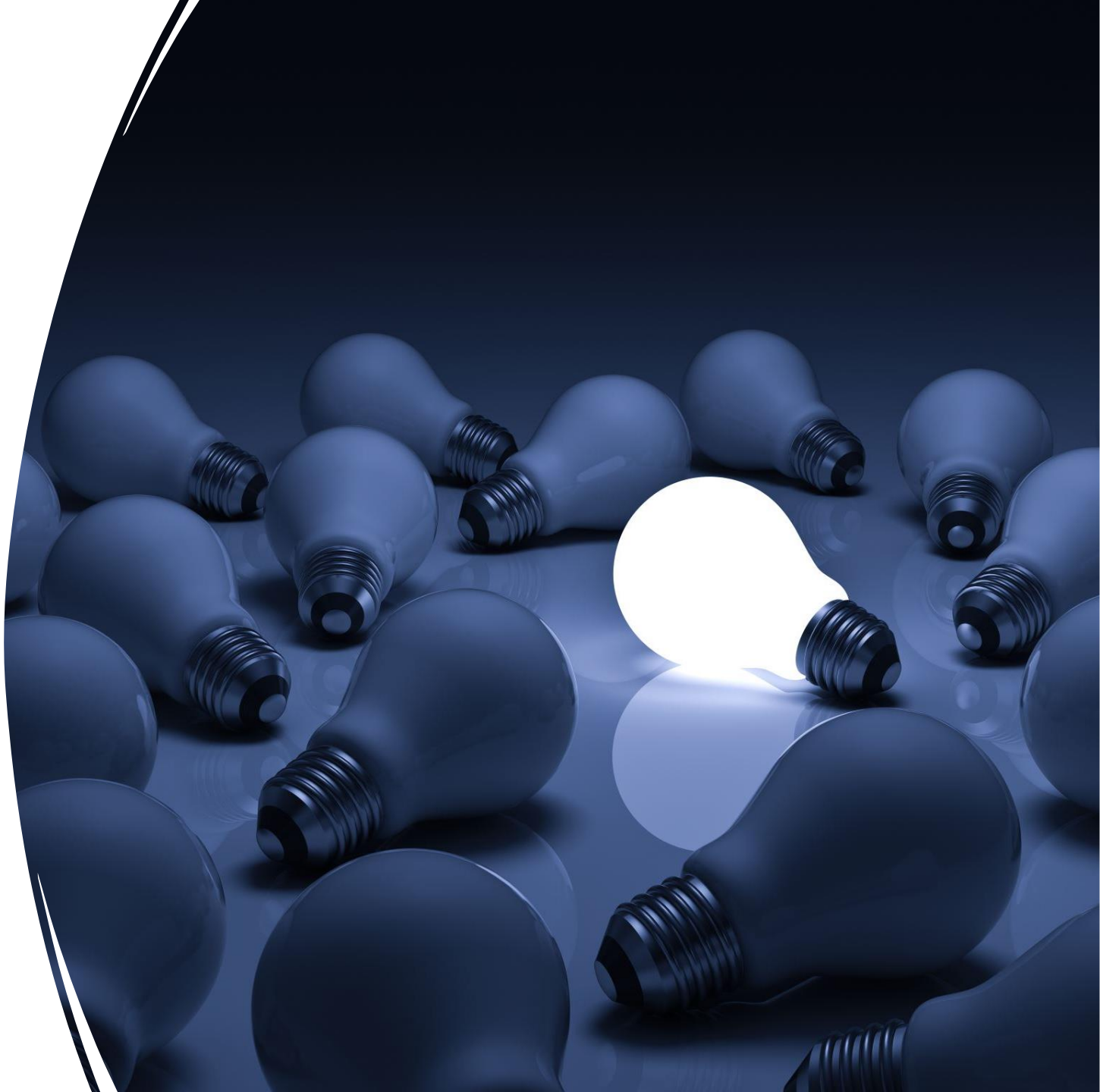
Programming languages

- See Table 4.11
- Sets of keywords, commands, symbols, and rules for constructing statements
- Allows **humans** to **communicate** instructions to a **computer**

Syntax: a set of **rules** associated with a programming language

What system software(s) and what application(s) have you chosen to use in your project?

Ask yourself: Is there an existing application software I can use in my project?



Homework

READ TEXTBOOK
CHAPTER 5

DRAW A PROJECT MAP
ABOUT YOUR BUSINESS