# Computer Software

Avinash Maskey

# Introduction

- As you already know, all computers require software in order to operate and perform basic tasks.
- For instance, software is needed to translate your commands into a form the computer can understand, to open and close other software programs, to manage your stored files, and to locate and set up new hardware as it is added to a computer.
- The type of software used to perform the above tasks is system software—the focus of this chapter.
- ***System software*** runs in the background at all times, making it possible for you to use your computer.

# SYSTEM SOFTWARE VS. APPLICATION SOFTWARE

- Computers run two types of software: **system software** and **application software**.
- **System software:**
    - It consists of the operating system and utility programs that control your computer and allow you to use it.
    - These programs enable the ***computer to boot***, to ***launch application programs***, and to ***facilitate important jobs***, such as ***transferring files*** from one storage medium to another, ***configuring your computer*** to work with the hardware connected to it, ***connecting your computer to a network***, ***managing files*** on your hard drive, and ***protecting your computer*** from unauthorized use.

# SYSTEM SOFTWARE VS. APPLICATION SOFTWARE (Contd.)

- **Application software:**
  - It includes all the programs that allow you to perform specific tasks on your computer, such as ***writing a letter***, ***preparing an invoice***, ***viewing a Web page***, ***listening to a music file***, ***checking the inventory of a particular product***, ***playing a game***, ***preparing financial statements***, ***designing a home***, and so forth.
- In practice, the difference between system and application software is not always straightforward. Some programs, such as those used to burn DVDs, were originally viewed as utility programs.
- Today, these programs typically contain a variety of additional features, such as the ability to organize and play music and other media files, transfer videos and digital photos to a computer, edit videos and photos, create DVD movies, copy CDs and DVDs, and create slide shows. Consequently, these programs now fit the definition of **application software** more closely.

# SYSTEM SOFTWARE VS. APPLICATION SOFTWARE (Contd.)

- On the other hand, system software today typically contains several application software components.
- For example, the **Microsoft Windows** operating system includes a variety of application programs including a ***Web browser***, a ***calculator***, a ***calendar program***, a ***painting program***, a ***media player***, a ***movie making program***, an ***instant messaging program***, and a ***text editing program***.
- A program's classification as **system or application software** usually depends on the principal function of the program, and the distinction between the two categories is not always clear cut.

# Software Acquisition

- The act or process of acquiring software in different ways like **purchase**, ***download free*** from internet or get it ***bundled*** along with hardware is called software acquisition. It is the way in which the software are made available to users.
- Some of the ways in which the software are made available to users are as follows:
  - ***Retail software:*** It is the software sold in retail stores. It comes with printed manuals and installation instructions. For E.g. MS windows OS.
  - ***Original Equipment Manufacturer (OEM) software:*** It refers to software which is sold, and bundled with hardware. Microsoft sells its operating system as OEM software to hardware dealers. OEM software is sold at reduced price, without the manuals, packaging and installation instructions.

# Software Acquisition (Contd.)

- ***Shareware:*** It is a program where the user is allowed to try for free, for a specified period of time, as defined in the license. It is downloadable from the Internet. When the trial period ends, the software must be purchased or uninstalled. E.g., ***WinZip***, ***Adobe Acrobat***, ***PHP Debugger*** etc.

- ***Freeware:*** It is software that is free for personal use. It is downloadable from the Internet. The commercial use of this software may require a paid license. The author of the freeware software is the owner of the software, though others may use it for free. The users abide by the license terms, where the user cannot make changes to it, or sell it to someone else. E.g., ***Google Talk***, ***yahoo messenger***, ***MSN messenger***, ***Team Viewer*** etc.

- ***Open source software:*** It is software whose source code is available and can be customized and altered within the specified guidelines laid down by the creator. Unlike public domain software, open-source software has restrictions on their use and modification, redistribution limitations, and copyrights. ***Linux***, ***Apache***, ***Firefox***, ***OpenOffice*** are some examples of open-source software.

# Software Acquisition (Contd.)

- ***Public Domain Software:*** It is free software. Unlike freeware, public domain software does not have a copyright owner or license restrictions. The source code is publicly available for anyone to use. Public domain software can be modified by the user. It is free and open-source software that can be publicly modified, distributed or sold without any restrictions. E.g., ***SQLite*** etc.

- ***Demo Software:*** It is designed to demonstrate what a purchased version of the software is capable of doing and provides a restricted set of features. To use the software, the user must buy a fully-functional version. E.g., ***Office 365***, ***QuickBooks*** etc.

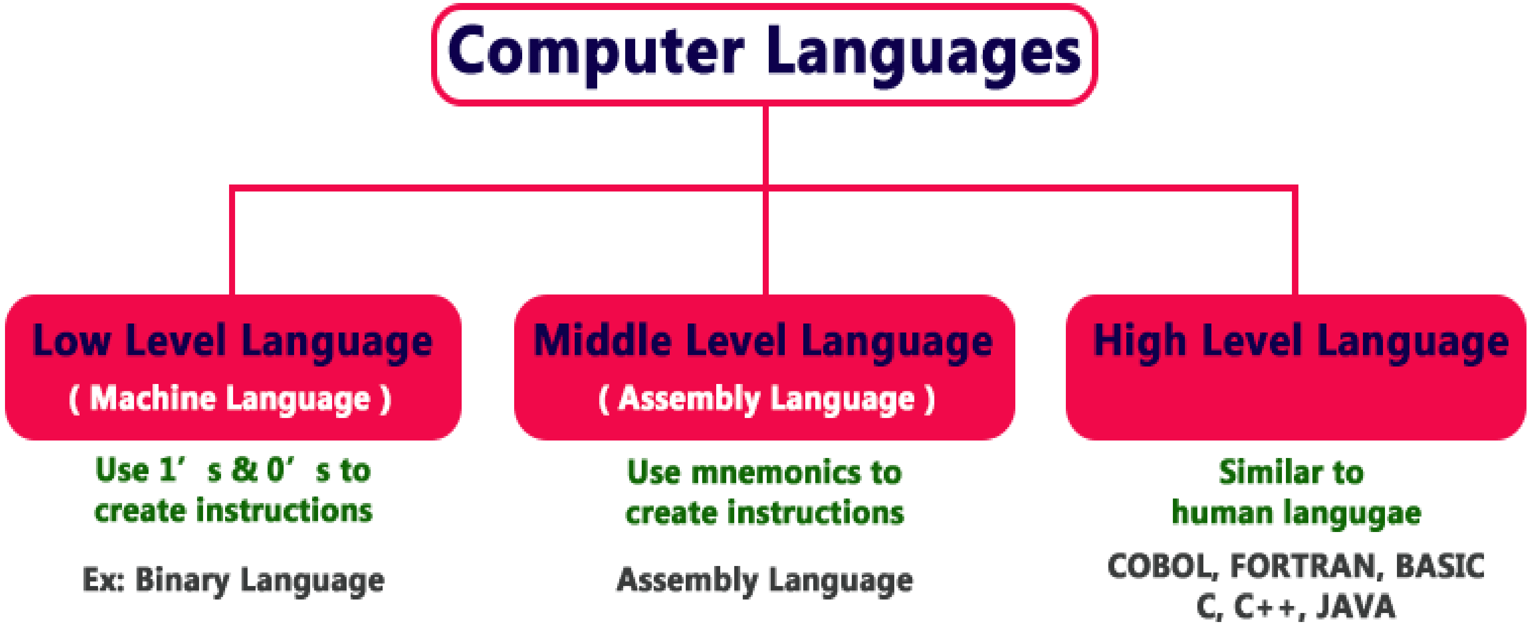
# Programming (or Computer ) Languages

# What is a Program and Programming Language?

- A ***program*** is a collection of instructions that performs a specific task when executed by a computer. Most computer devices require programs to function properly.
- A ***programming language*** is a vocabulary and set of grammatical rules for instructing a computer or computing device to perform specific tasks.
- In other words, a ***programming language*** is a notation for writing programs, which are specifications of a computation or algorithm.

# Levels / Classification of Programming Language

- Over the years, computer languages have been evolved from Low-Level to High-Level Languages. In the earliest days of computers, only Binary Language was used to write programs. The computer languages are classified as follows.



Computer Languages

Low Level Language
( Machine Language )

Use 1’ s & 0’ s to
create instructions

Ex: Binary Language

Middle Level Language
( Assembly Language )

Use mnemonics to
create instructions

Assembly Language

High Level Language

Similar to
human langugae

COBOL, FORTRAN, BASIC
C, C++, JAVA

# Low-Level Language (Machine Language)

- ***Low-Level language*** is the only language which can be understood by the computer. Binary Language is an example of a low-level language. Low-level language is also known as ***Machine Language***.
- The binary language contains only two symbols 1 & 0. All the instructions of binary language are written in the form of binary numbers 1's & 0's. A computer can directly understand the binary language. Machine language is also known as the Machine Code.
- As the CPU directly understands the binary language instructions, it does not require any translator. CPU directly starts executing the binary language instructions and takes very less time to execute the instructions as it does not require any translation.
- Low-level language is considered as the ***First Generation Language (1GL).***

# Machine Language: Advantages/Disadvantages

- **Advantages:**
  - A computer can easily understand the low-level language.
  - Low-level language instructions are executed directly without any translation.
  - Low-level language instructions require very less time for their execution.

- **Disadvantages**
  - Low-level language instructions are very difficult to use and understand.
  - Low-level language instructions are machine-dependent, that means a program written for a particular machine does not execute on another machine.
  - In low-level language, there is more chance for errors and it is very difficult to find errors, debug and modify.

# Middle-Level Language (Assembly Language)

- ***Middle-level language*** is a computer language in which the instructions are created using symbols such as letters, digits and special characters. ***Assembly language*** is an example of middle-level language.
- In assembly language, we use predefined words called mnemonics. Binary code instructions in low-level language are replaced with mnemonics and operands in middle-level language.
- But the computer cannot understand mnemonics, so we use a ***translator*** called ***Assembler*** to translate mnemonics into binary language.
- ***Assembler*** is a translator which takes assembly code as input and produces machine code as output. That means, the computer cannot understand middle-level language, so it needs to be translated into a low-level language to make it understandable by the computer.
- ***Assembler*** is used to translate middle-level language into low-level language.

# Assembly Language: Advantages/Disadvantages

- **Advantages:**
  - Writing instructions in a middle-level language is easier than writing instructions in a low-level language.
  - Middle-level language is more readable compared to low-level language.
  - Easy to understand, find errors and modify.

- **Disadvantages**
  - Middle-level language is specific to a particular machine architecture, that means it is machine-dependent.
  - Middle-level language needs to be translated into low-level language.
  - Middle-level language executes slower compared to low-level language.

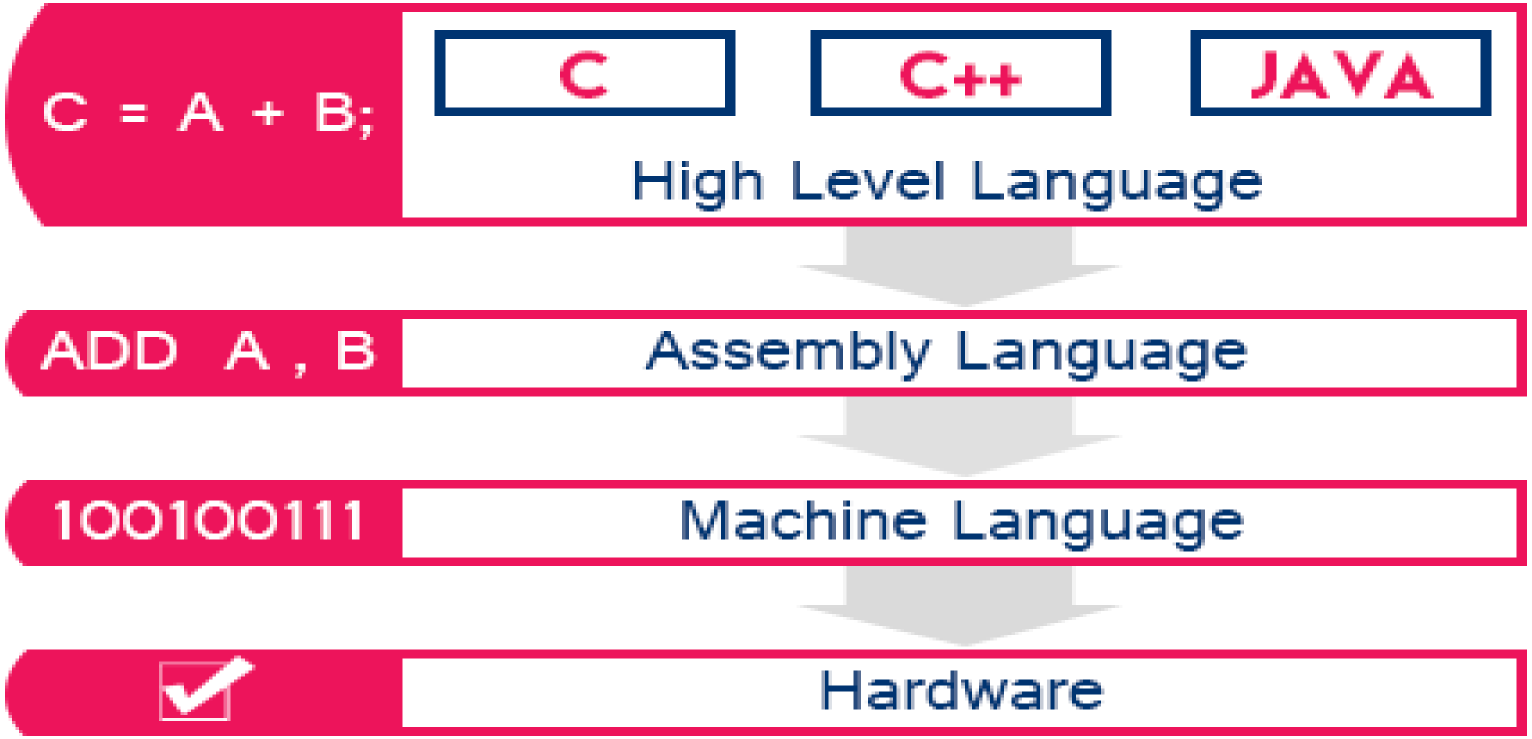
# High-Level Language

- A ***high-level language*** is a computer language which can be understood by the users. The high-level language is very similar to human languages and has a set of grammar rules that are used to make instructions more easily.
- Every high-level language has a set of ***predefined words*** known as ***Keywords*** and a set of rules known as ***Syntax*** to create instructions. The high-level language is easier to understand for the users but the computer can not understand it.
- High-level language needs to be converted into the low-level language to make it understandable by the computer. We use ***Compiler*** or ***interpreter*** to convert high-level language to low-level language.
- Languages like ***COBOL, FORTRAN, BASIC, C, C++, JAVA***, etc., are examples of high-level languages.
- All these programming languages use human-understandable language like English to write program instructions. These instructions are converted to low-level language by the compiler so that it can be understood by the computer.

# High-Level Language: Advantages/Disadvantages

- **Advantages:**
  - Writing instructions in a high-level language is easier.
  - A high-level language is more readable and understandable.
  - The programs created using high-level language runs on different machines with little change or no change.
  - Easy to understand, create programs, find errors and modify.
- **Disadvantages**
  - High-level language needs to be translated into low-level language.
  - High-level language executes slower compared to middle and low-level languages.

# Figure: Understanding Computer Languages



# Operating System (OS)

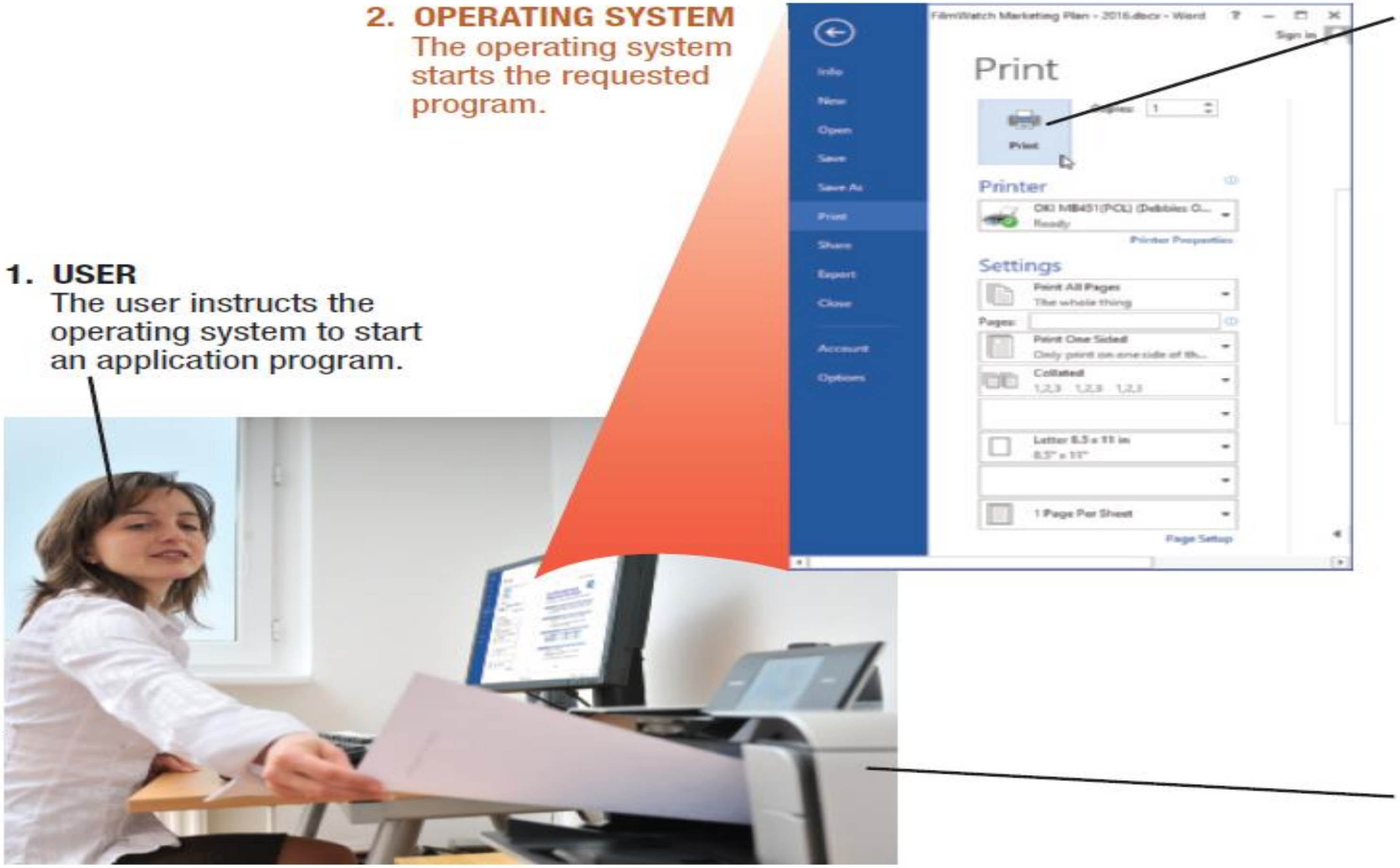
# Introduction

- A computer’s operating system is a collection of programs that manage and coordinate the activities taking place within the computer and it is the most critical piece of software installed on the computer.
- The operating system boots the computer, launches application software, and ensures that all actions requested by a user are valid and processed in an orderly fashion.
- For example, when you issue the command for your computer to store a document on your hard drive, the operating system must perform the following steps:

# Introduction (Contd.)

  - make sure that the specified hard drive exists,
  - verify that there is adequate space on the hard drive to store the document and then store the document in that location, and
  - update the hard drive’s directory with the filename and disk location for that file so that the document can be retrieved again when needed.
- In addition to managing all of the resources associated with your local computer, the operating system also facilitates connections to the Internet and other networks.
- In general, the operating system serves as an intermediary between the user and the computer, as well as between application programs and the computer system’s hardware.
- Without an operating system, no other program can run, and the computer cannot function.

# Figure: The intermediary role of OS



2. **OPERATING SYSTEM**
   The operating system starts the requested program.

1. **USER**
   The user instructs the operating system to start an application program.

3. **USER**
   The user instructs the application program to open a document and then print it.

4. **APPLICATION PROGRAM**
   The application program hands the document over to the operating system for printing.

5. **OPERATING SYSTEM**
   The operating system sends the document to the printer.

6. **PRINTER**
   The printer prints the document.

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# Objectives of OS

- The objectives of the operating system are :
  - To make the computer system convenient to use in an efficient manner.
  - To hide the details of the hardware resources from the users.
  - To provide users a convenient interface to use the computer system.
  - To act as an intermediary between the hardware and its users, making it easier for the users to access and use other resources.
  - To manage the resources of a computer system.
  - To keep track of who is using which resource, granting resource requests, and mediating conflicting requests from different programs and users.
  - To provide efficient and fair sharing of resources among users and programs.

# Functions of an OS

- Operating systems have a wide range of functions—some of the most important are:
    - Interfacing with Users
    - Process Management (Booting the Computer)
    - File Management
    - Memory Management
    - Protection and Security
    - Device Management (Configuring Devices)

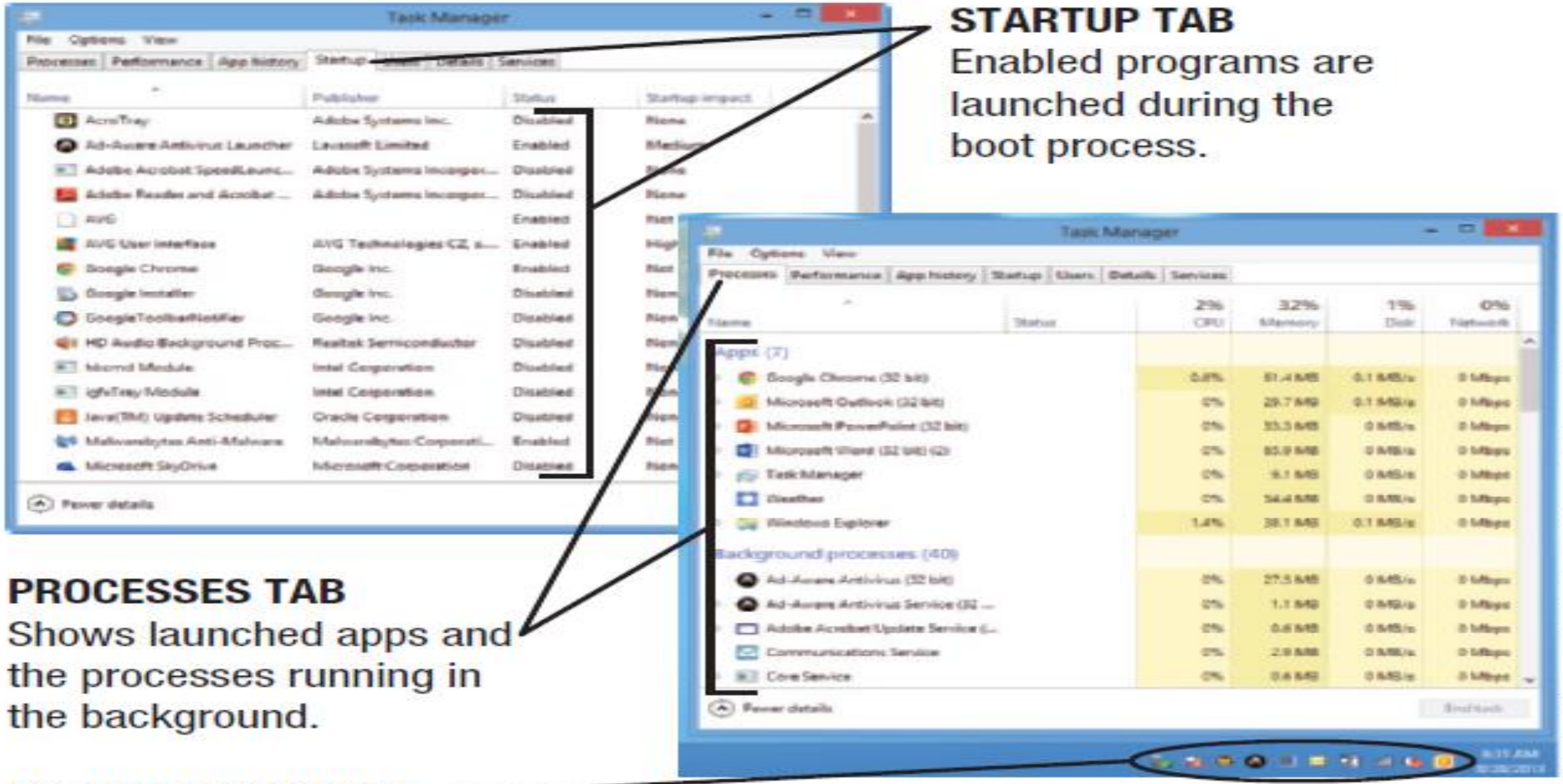
# Interfacing With the Users

- As shown in previous figure “role of OS”, one of the principal roles of every operating system is to translate user instructions into a form the computer can understand.
- It also translates any feedback from hardware—such as a signal that the printer has run out of paper or that a new hardware device has been connected to the computer—into a form that the user can understand.
- The means by which an operating system or any other program interacts with the user is called the ***user interface***; user interfaces can be ***text-based*** or ***graphics-based***.
- Most, but not all, operating systems today use a graphical user interface (GUI).

# Process Management (Booting the Computer)

- The first task your operating system performs when you power up your computer is to ***boot*** the computer.
- During the boot process, the essential portion, or core, of the operating system (called the ***kernel***) is loaded into memory. The kernel remains in memory the entire time the computer is on so that it is always available; other parts of the operating system are retrieved from the hard drive and loaded into memory when they are needed.
- Typically, many programs are running in the background all the time, even before the user launches any application software.
- The ***Windows Task Manager*** (shown in Figure) lists all the programs and processes (program tasks) currently running on a computer. Some of these programs are startup programs that are launched automatically by the operating system during the boot process; regardless of how programs are launched, they all consume memory and processing power.

# Figure: Windows Task Manager


Task Manager
File Options View
Processes Performance App history Startup Users Details Services
Power details

| Name | Publisher | Status | Startup impact |
|---|---|---|---|
| AcroTray | Adobe Systems Inc. | Disabled | None |
| Ad-Aware Antivirus Launcher | Lavasoft Limited | Enabled | Medium |
| Adobe Acrobat SpeedLaunc... | Adobe Systems Incorpor... | Disabled | None |
| Adobe Reader and Acrobat ... | Adobe Systems Incorpor... | Disabled | None |
| AVG |  | Enabled | Not |
| AVG User Interface | AVG Technologies CZ, s.... | Enabled | High |
| Google Chrome | Google Inc. | Enabled | Not |
| Google Installer | Google Inc. | Disabled | None |
| GoogleToolbarNotifier | Google Inc. | Disabled | None |
| HD Audio Background Proc... | Realtek Semiconductor | Disabled | None |
| hkcmd Module | Intel Corporation | Disabled | None |
| igfxTray Module | Intel Corporation | Disabled | None |
| Java(TM) Update Scheduler | Oracle Corporation | Disabled | None |
| Malwarebytes Anti-Malware | Malwarebytes Corporati... | Enabled | Not |
| Microsoft SkyDrive | Microsoft Corporation | Disabled | None |

| Name | Status | 2%<br>CPU | 32%<br>Memory | 1%<br>Disk | 0%<br>Network |
|---|---|---|---|---|---|
| Apps (7) |  |  |  |  |  |
| Google Chrome (32 bit) |  | 0.8% | 81.4 MB | 0.1 MB/s | 0 Mbps |
| Microsoft Outlook (32 bit) |  | 0% | 29.7 MB | 0.1 MB/s | 0 Mbps |
| Microsoft PowerPoint (32 bit) |  | 0% | 33.3 MB | 0 MB/s | 0 Mbps |
| Microsoft Word (32 bit) (2) |  | 0% | 83.9 MB | 0 MB/s | 0 Mbps |
| Task Manager |  | 0% | 9.1 MB | 0 MB/s | 0 Mbps |
| Weather |  | 0% | 54.4 MB | 0 MB/s | 0 Mbps |
| Windows Explorer |  | 1.4% | 38.1 MB | 0.1 MB/s | 0 Mbps |
| Background processes (40) |  |  |  |  |  |
| Ad-Aware Antivirus (32 bit) |  | 0% | 27.5 MB | 0 MB/s | 0 Mbps |
| Ad-Aware Antivirus Service (32 ... |  | 0% | 1.1 MB | 0 MB/s | 0 Mbps |
| Adobe Acrobat Update Service (... |  | 0% | 0.6 MB | 0 MB/s | 0 Mbps |
| Communications Service |  | 0% | 2.9 MB | 0 MB/s | 0 Mbps |
| Core Service |  | 0% | 0.6 MB | 0 MB/s | 0 Mbps |

**STARTUP TAB**
Enabled programs are launched during the boot process.

**PROCESSES TAB**
Shows launched apps and the processes running in the background.

**NOTIFICATION AREA**
Icons represent programs running in the background.

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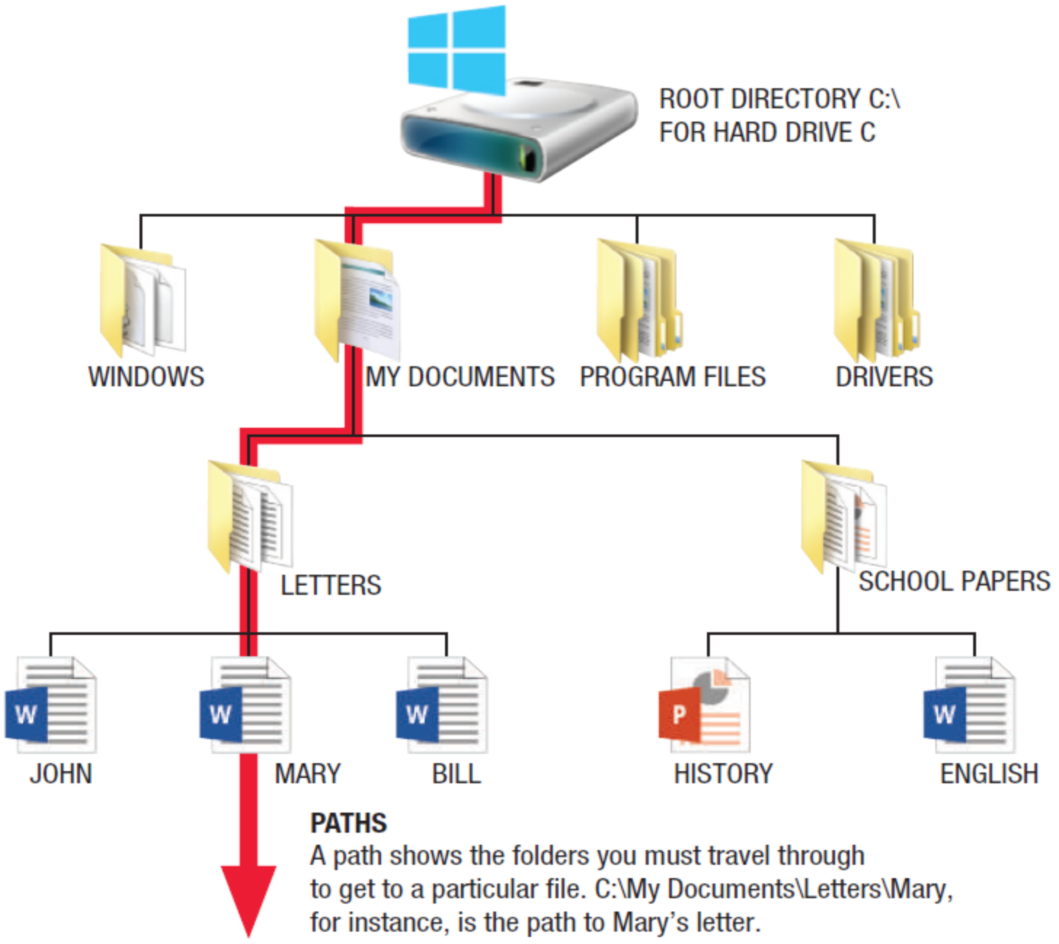
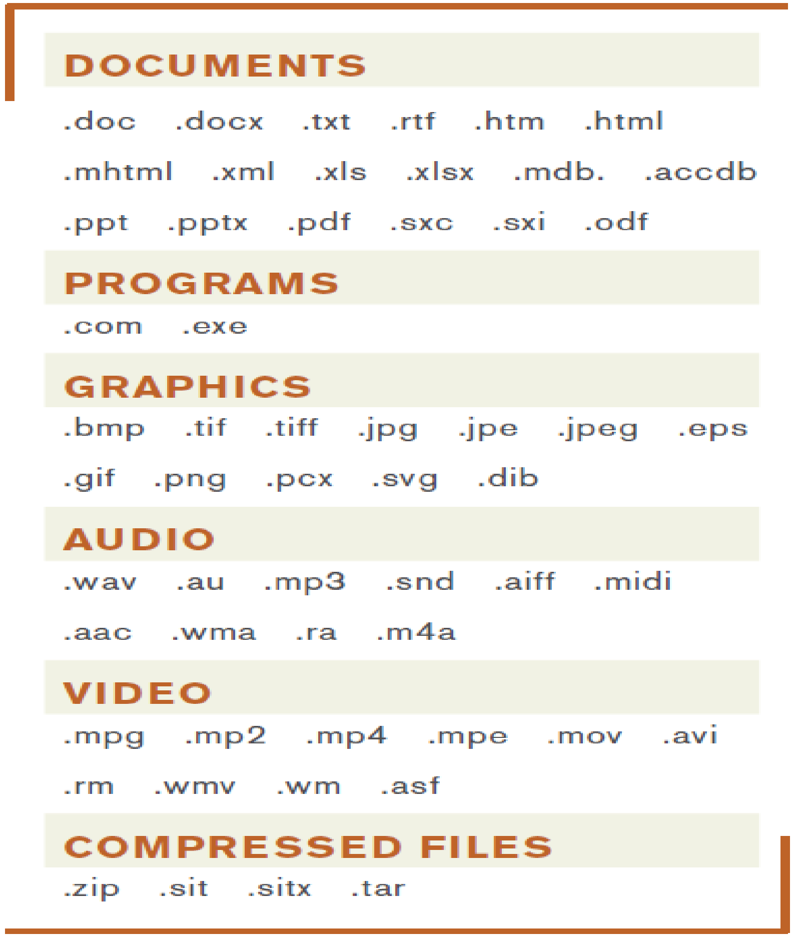
# File Management

- Another important task that the operating system performs is ***file management***—keeping track of the files stored on a computer so that they can be retrieved when needed.
- As discussed earlier, you can organize the files on a storage medium into folders to simplify file management.
- Usually the operating system files are stored inside one folder (such as a Windows folder), and each application program is stored in its own separate folder inside a main programs folder (such as Program Files).
- Other folders designed for storing data files are typically created by the operating system for each user (such as My Documents, My Music, and My Pictures folders); individuals may create additional folders, as desired, to keep their files organized. Folders can contain both files and other folders (called subfolders).

# Figure: File Management and File Extensions



**PATHS**
A path shows the folders you must travel through to get to a particular file. C:\My Documents\Letters\Mary, for instance, is the path to Mary's letter.



**DOCUMENTS**

.doc .docx .txt .rtf .htm .html
.mhtml .xml .xls .xlsx .mdb. .accdb
.ppt .pptx .pdf .sxc .sxi .odf

**PROGRAMS**

.com .exe

**GRAPHICS**

.bmp .tif .tiff .jpg .jpe .jpeg .eps
.gif .png .pcx .svg .dib

**AUDIO**

.wav .au .mp3 .snd .aiff .midi
.aac .wma .ra .m4a

**VIDEO**

.mpg .mp2 .mp4 .mpe .mov .avi
.rm .wmv .wm .asf

**COMPRESSED FILES**

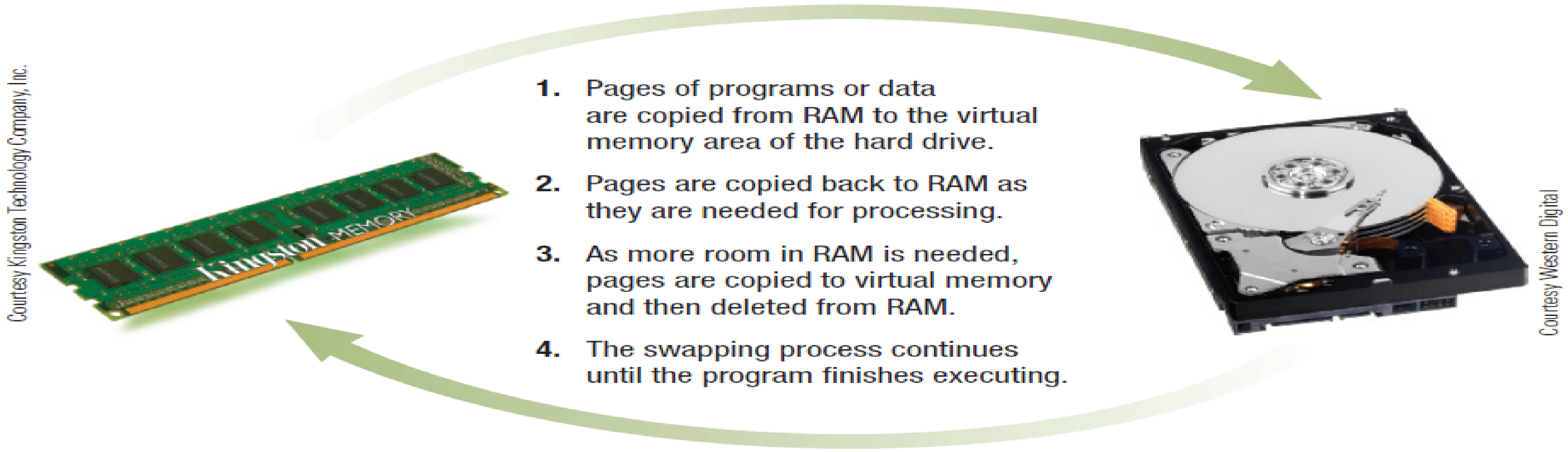
.zip .sit .sitx .tar

# Memory Management

- Because many of today's programs are memory intensive, good memory management, which involves optimizing the use of main memory (RAM), can help speed up processing.
- The operating system allocates RAM to programs as needed and then reclaims that memory when the program is closed.
- Because each additional running program or open window consumes memory, users can also help with memory management by limiting the number of startup programs to only the ones that are absolutely necessary, as well as by closing windows when they are no longer needed.
- One memory-management technique frequently used by operating systems is virtual memory, which uses a portion of the computer's hard drive as additional RAM. All programs and data located in RAM are divided into ***fixed-length*** pages or ***variable length*** segments, depending on the operating system being used.

# Memory Management (Contd.)

- When the amount of RAM required exceeds the amount of RAM available, the operating system moves pages from RAM to the virtual memory (VM) area of the hard drive (this area is called the page file or swap file).
- Consequently, as a program is executed, some of the program may be stored in RAM and some in virtual memory. Below, is the figure of how **VM** works.



1. Pages of programs or data are copied from RAM to the virtual memory area of the hard drive.
2. Pages are copied back to RAM as they are needed for processing.
3. As more room in RAM is needed, pages are copied to virtual memory and then deleted from RAM.
4. The swapping process continues until the program finishes executing.

# Protection and Security

- A computer’s operating system can use passwords, biometric characteristics (such as fingerprints), and other security procedures to limit access to the computer and other system resources to only authorized users.
- Most operating systems also include other security features, such as an integrated firewall to protect against unauthorized access via the Internet or an option to download and install security patches (small program updates that correct known security problems) automatically from the operating system’s manufacturer on a regular basis.
- Operating system passwords can also be used to ensure that administrative level operating system tasks (such as installing programs or changing system settings) are performed only by authorized users.

# Device Management (Configuring Devices)

- The operating system also configures all devices connected to a computer. Small programs called **device drivers** (or simply **drivers**) are used to communicate with peripheral devices, such as monitors, printers, portable storage devices, and keyboards.
- Most operating systems today include the drivers needed for the most common peripheral devices. In addition, drivers often come on a CD packaged with the peripheral device or they can be downloaded from the manufacturer’s Web site.
- Most operating systems today look for and recognize new devices each time the computer boots. If a new device is found, the operating system typically tries to install (or upgrade) the appropriate driver automatically in order to get the new hardware ready to use—a feature called ***Plug and Play***.
- To ***avoid failure or corruption***, we can enable the automatic updates which is a good idea to keep your system running smoothly and protected from new threats.

# Examples or Categories of OS

- Operating systems are typically designed for a particular type of device.
- For example, operating systems used with personal computers are typically referred to as ***personal operating systems*** (also called ***desktop operating systems***) and they are designed to be installed on a single computer.
- In contrast, ***server operating systems*** (also called ***network operating systems***) are designed to be installed on a network server to grant multiple users access to a network and its resources.
- Each computer on a network has its own ***personal operating system*** installed (just as with a stand-alone computer) and that operating system controls the activity on that computer.
- While the ***server operating system*** controls access to network resources. Computers on a network may also need special client software to access the network and issue requests to the server.

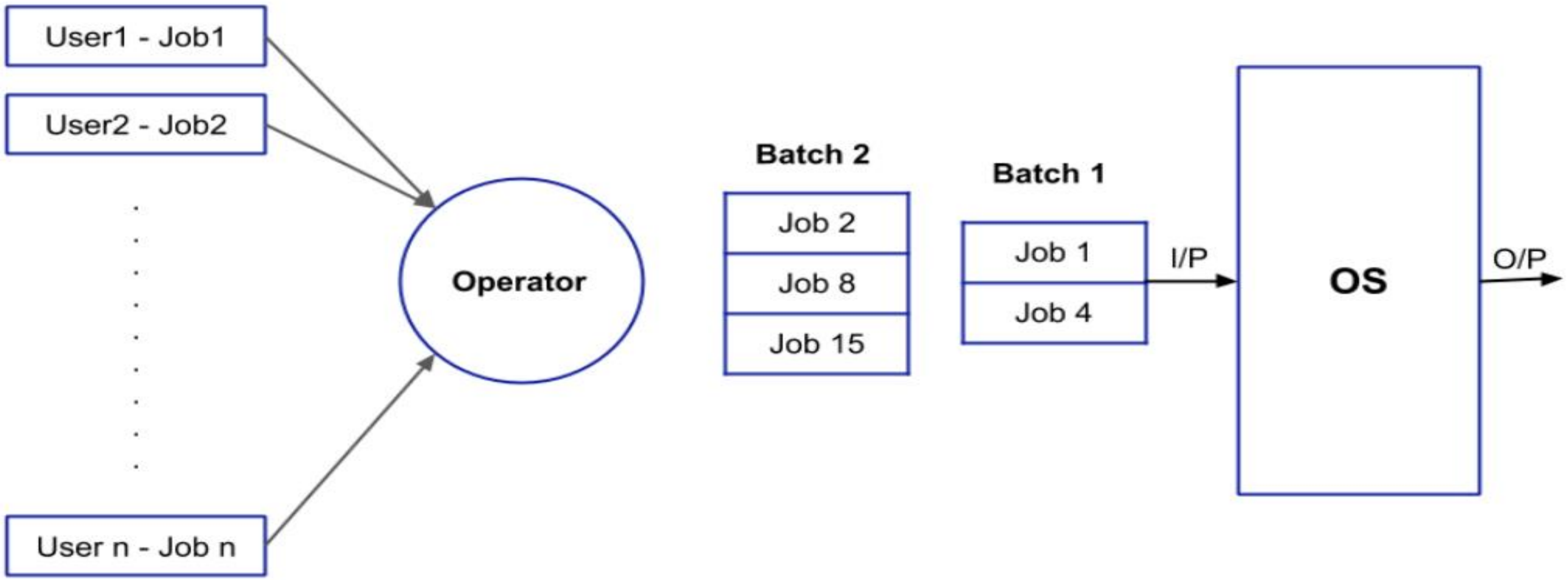
# Types of Operating System

- We studied that an Operating System (**OS**) is a software that acts as an intermediate between the user and the hardware components of the system. The Operating System is responsible for managing various resources of the system.
- OS are classified into different types depending on their capability of processing as follows:
  - ***Batch Operating System***
  - ***Time-Sharing Operating System***
  - ***Distributed Operating System***
  - ***Embedded Operating System***
  - ***Real-time Operating System***

# Types of OS - Batch Operating System

- In a ***Batch Operating System***, the similar jobs are grouped together into batches with the help of some operator and these batches are executed one by one. For example, let us assume that we have 10 programs that need to be executed. Some programs are written in C++, some in C and rest in Java.
- Now, every time when we run these programmes individually then we will have to load the compiler of that particular language and then execute the code.
- But what if we make a batch of these 10 programmes. The benefit with this approach is that, for the C++ batch, you need to load the compiler only once. Similarly, for Java and C, the compiler needs to be loaded only once and the whole batch gets executed.

# Types of OS – Batch Operating System



# Types of OS – Batch Operating System

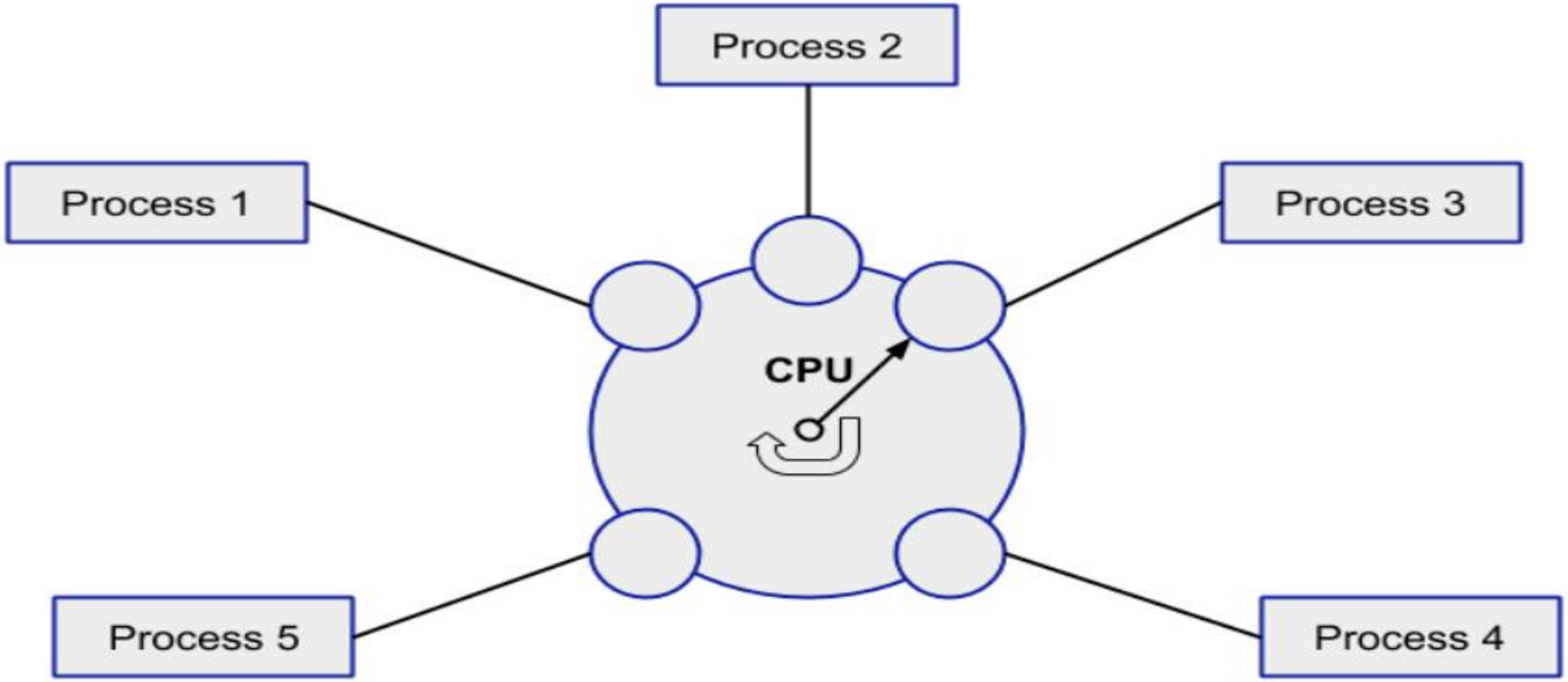
- ***Advantages:***
    - The overall time taken by the system to execute all the programmes will be reduced.
    - The Batch Operating System can be shared between multiple users.

- ***Disadvantages:***
    - Manual interventions are required between two batches.
    - The CPU utilization is low because the time taken in loading and unloading of batches is very high as compared to execution time.

# Types of OS - Time-Sharing Operating System

- In a ***Multi-tasking Operating System***, more than one processes are being executed at a particular time with the help of the ***time-sharing concept***.
- So, in the time-sharing environment, we decide a time that is called time quantum and when the process starts its execution then the execution continues for only that amount of time and after that, other processes will be given chance for that amount of time only.
- In the next cycle, the first process will again come for its execution and it will be executed for that time quantum only and again next process will come. This process will continue.

# Types of OS - Time-Sharing Operating System



# Types of OS – Time-Sharing Operating System

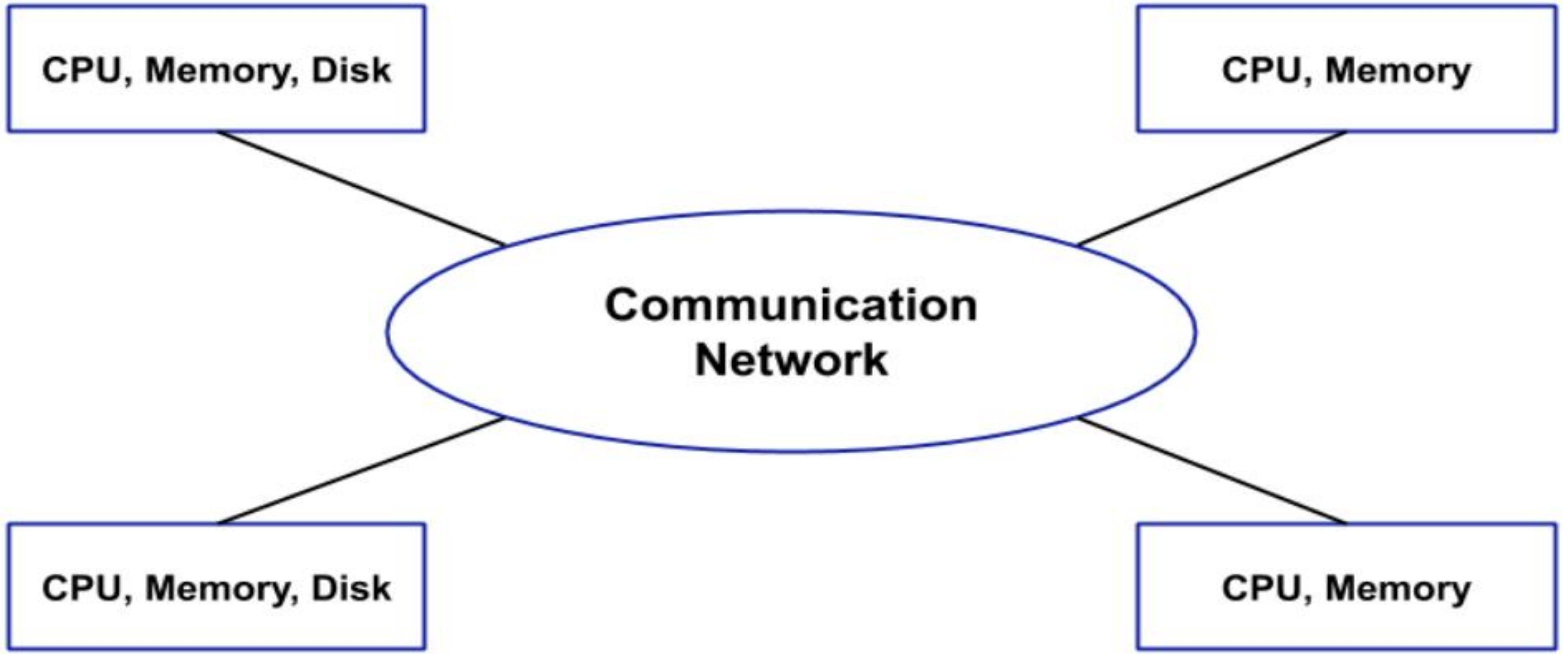
- ***Advantages:***
  - Since equal time quantum is given to each process, so each process gets equal opportunity to execute.
  - The CPU will be busy in most of the cases and this is good to have case.

- ***Disadvantages:***
  - Process having higher priority will not get the chance to be executed first because the equal opportunity is given to each process.

# Types of OS - Distributed Operating System

- In a ***Distributed Operating System***, we have various systems and all these systems have their own CPU, main memory, secondary memory, and resources.
- These systems are connected to each other using a shared communication network. Here, each system can perform its task individually.
- The best part about these ***Distributed Operating System*** is remote access i.e. one user can access the data of the other system and can work accordingly. So, remote access is possible in these distributed Operating Systems.

# Types of OS - Distributed Operating System



# Types of OS – Distributed Operating System

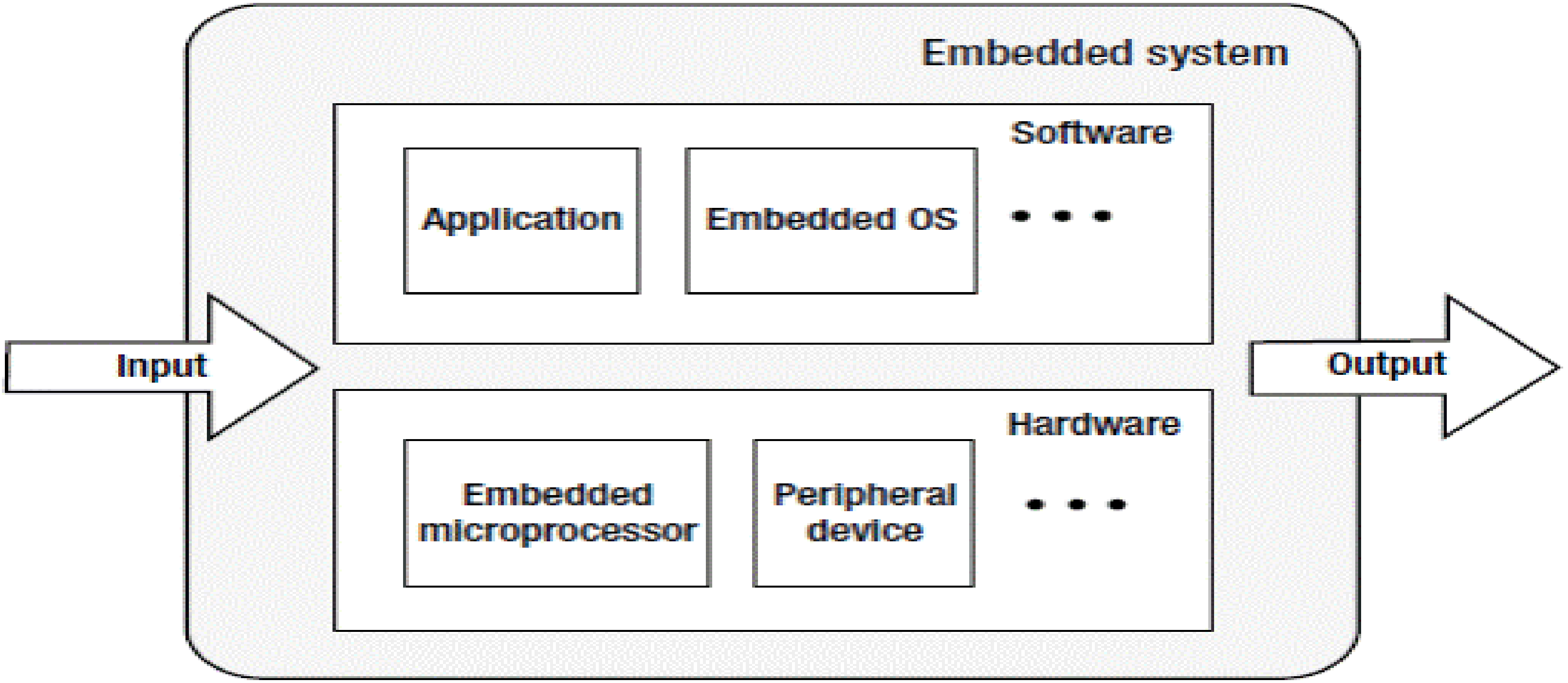
- ***Advantages:***
    - Since the systems are connected with each other so, the failure of one system can't stop the execution of processes because other systems can do the execution.
    - Resources are shared between each other.
    - The load on the host computer gets distributed and this, in turn, increases the efficiency.

- ***Disadvantages:***
    - Since the data is shared among all the computers, so to make the data secure and accessible to few computers, you need to put some extra efforts.
    - If there is a problem in the communication network then the whole communication will be broken.

# Types of OS - Embedded Operating System

- An ***Embedded Operating System*** is designed to perform a specific task for a particular device which is not a computer.
- For example, the software used in elevators is dedicated to the working of elevators only and nothing else. So, this can be an example of Embedded Operating System.
- The Embedded Operating System allows the access of device hardware to the software that is running on the top of the Operating System.

# Types of OS - Embedded Operating System



# Types of OS – Embedded Operating System

- ***Advantages:***
  - Since it is dedicated to a particular job, so it is fast.
  - Low cost.
  - These consume less memory and other resources.
- ***Disadvantages:***
  - Only one job can be performed.
  - It is difficult to upgrade or is nearly scalable.

# Types of OS - Real-time Operating System

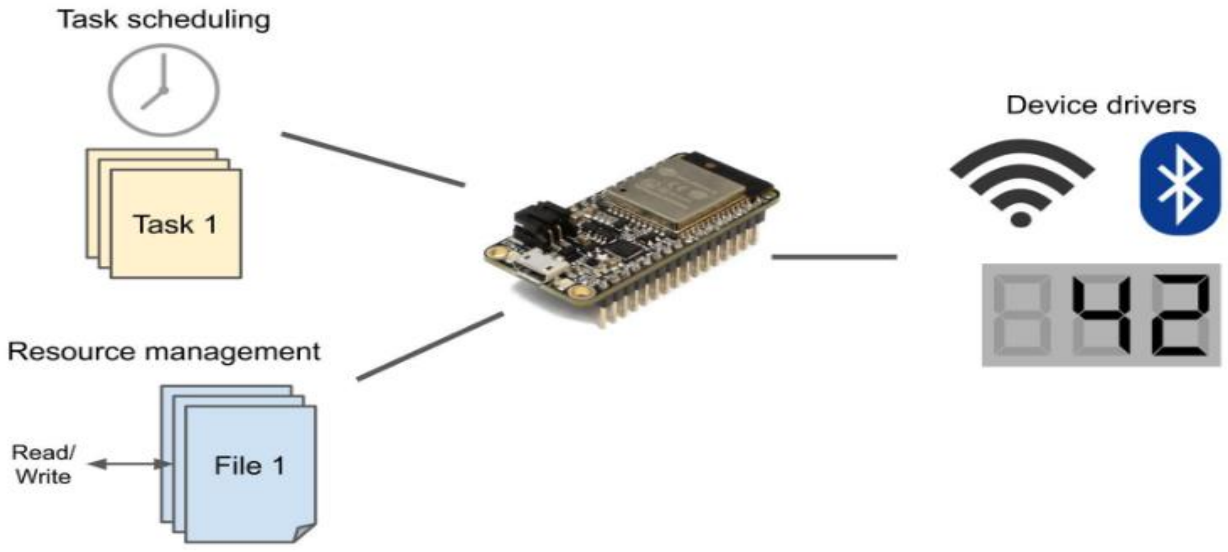
- The ***Real-time Operating Systems*** are used in the situation where we are dealing with some real-time data.
- So, as soon as the data comes, the execution of the process should be done and there should be no delay i.e. no ***buffer delays*** should be there.
- Real-time OS is a time-sharing system that is based on the concept of clock interrupt. So, whenever you want to process a large number of request in a very short period of time, then you should use Real-time Operating System.
- For example, the details of the ***temperature of the petroleum industry*** are very crucial and this should be done in real-time and in a very short period of time.
- A small delay can result in a life-death situation. So, this is done with the help of Real-time Operating System.

# Types of OS - Real-time Operating System

- There are two ***types*** of Real-time Operating System:

  ***Hard Real-time:*** In this type, a small delay can lead to drastic change. So, when the time constraint is very important then we use the Hard Real-time.

  ***Soft Real-time:*** Here, the time constraint is not that important but here also we are dealing with some real-time data.

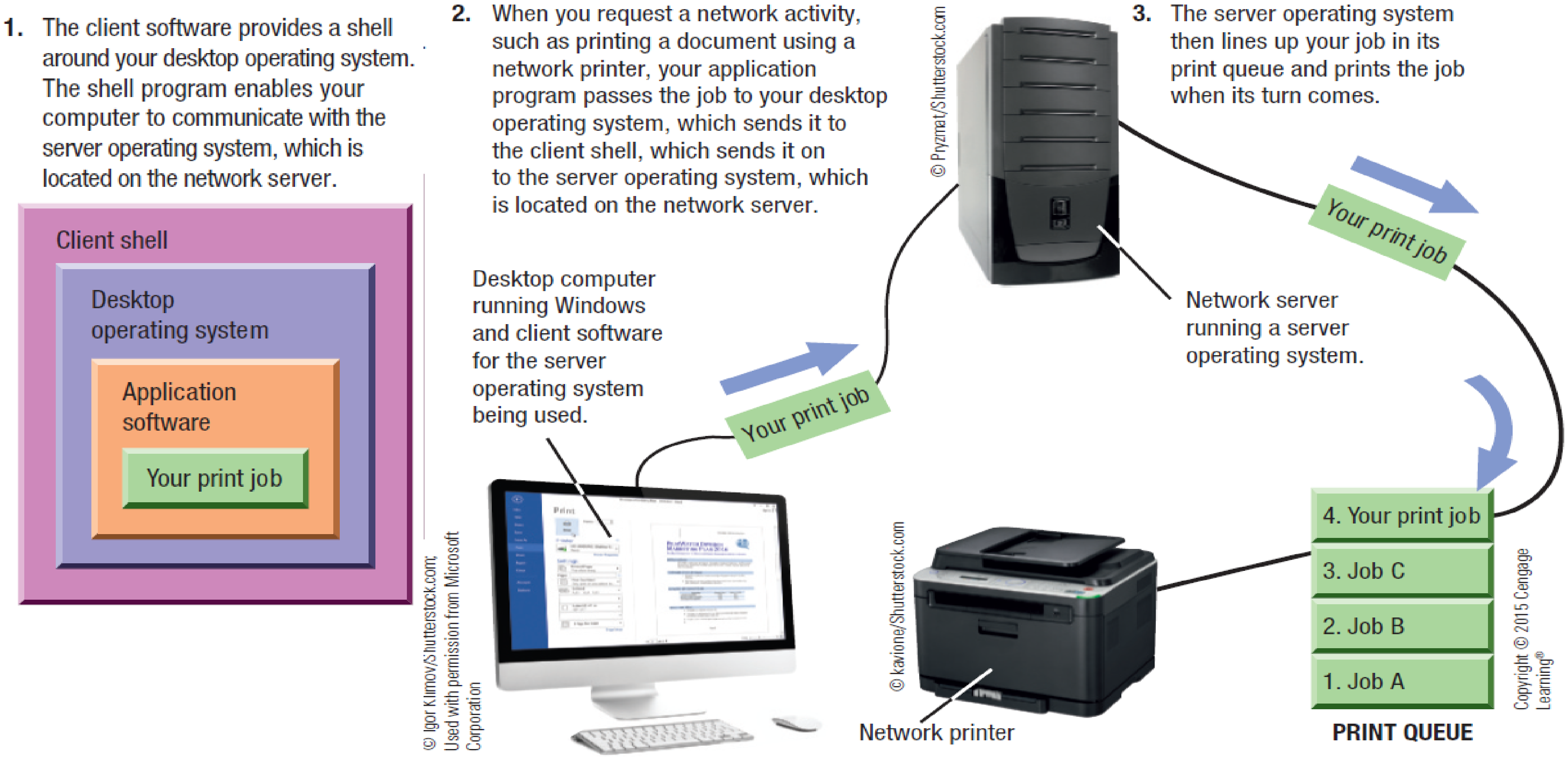


# Types of OS – Real-time Operating System

- ***Advantages:***
  - There is maximum utilization of devices and resources.
  - These systems are almost error-free.

- ***Disadvantages:***
  - The algorithms used in Real-time Operating System is very complex.
  - Specific device drivers are used for responding to the interrupts as soon as possible.

# How Network Operating System Works (NOS)?



1. The client software provides a shell around your desktop operating system. The shell program enables your computer to communicate with the server operating system, which is located on the network server.

2. When you request a network activity, such as printing a document using a network printer, your application program passes the job to your desktop operating system, which sends it to the client shell, which sends it on to the server operating system, which is located on the network server.

3. The server operating system then lines up your job in its print queue and prints the job when its turn comes.

Desktop computer running Windows and client software for the server operating system being used.

Network server running a server operating system.

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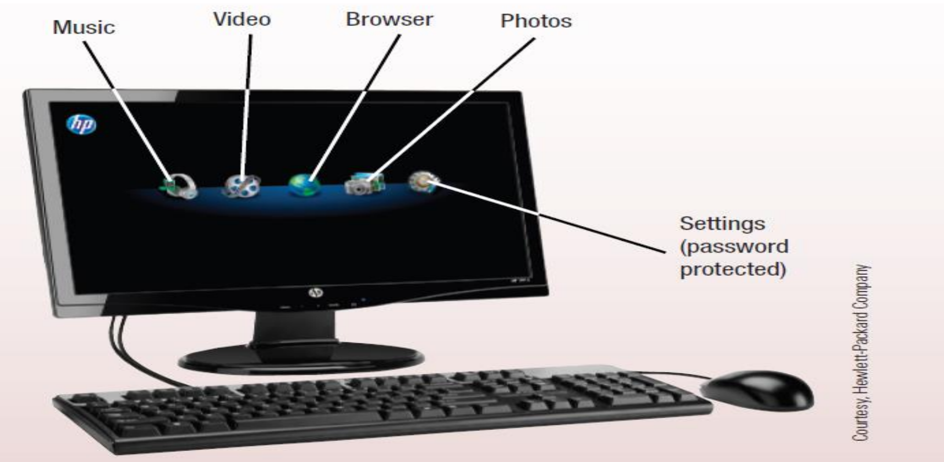
# New Trends In Software

- **Internet Monitors:**
  - The dilemma: How to offer visitors and customers easy-to use entertainment and Web browsing without compromising your business’s network or computers? The answer: ***Internet monitors***.
  - There are many locations—such as lobbies, waiting rooms, hotels, airports, and restaurants—where it would be a beneficial service for the business to offer visitors and customers easy to-use Web access.
  - But the expense and hassle of setting up a computer for customers to use—and having to maintain that computer when someone changes the settings or the computer gets infected with malware—is too much for many businesses. The solution? New, locked-down, inexpensive, easy-to-set-up systems, such as Internet monitors.



Courtesy, Hewlett-Packard Company

**Users have just four apps available via the device’s Home screen.**

# New Trends In Software (Contd.)

- **Smart Cars:**
  - Computers have been integrated into cars for years to perform specific tasks, such as assisting with gear shifting and braking.
  - Lately, however, the use of computers in cars has skyrocketed because they are being used to add additional convenience and safety to the driving experience.
  - Some features, such as GPS navigation systems and smart air bag systems that adjust the deployment of an air bag based on the weight of the occupant, are fairly standard today.
  - Integrated infotainment systems that use Bluetooth and USB ports to tie mobile phones and portable digital media players to the car stereo system, as well as to steering wheel and voice control systems, are also now available.
  - Some other new and emerging trends in smart cars are: ***Self-driving systems***, ***Self-parking/parking assist systems***, ***Lane departure systems***, ***Drowsiness detection systems***, ***Windshield displays***, ***Collision warning and auto brake systems***, ***Distraction-prevention systems*** etc.
  - One of the biggest ***challenges*** for smart car technologies is the safe use of all the smart gadgets being incorporated into cars. The concern stems from studies consistently showing that ***distracted drivers are the cause of a vast majority of crashes***.

# New Trends In Software (Contd.)

- **Open Source Software:**
  - The use of open source software has grown over the past few years, primarily for cost reasons. One of the first widely known open source programs was the Linux operating system.
  - However, there are also low-cost or no-cost open source alternatives for a wide selection of application programs today.
  - For instance, the free LibreOffice office suite can be used as an alternative to Microsoft Office, and the free GIMP program (see the figure below) can be used to retouch photos instead of Adobe Photoshop or another pricey image editing program.
  - In addition to saving you money, these alternative programs often require less disk space and memory than their commercial software counterparts require.

Courtesy GIMP

The GNU Image Manipulation Program (GIMP).

# New Trends In Software (Contd.)

- **Mobile Ticketing:**
  - A new trend in mobile apps is mobile ticketing. Mobile ticketing goes beyond just using your smartphone or other mobile device to locate and purchase tickets that are then mailed to you.
  - From concerts to sporting events to transportation to movie tickets, you can now use your mobile device as your actual admission ticket.
  - To buy a mobile ticket, you can typically use a mobile app, such as an individual app for a particular application or organization (such as eSewa, Khatlti for utility payments) or a generalized app (such as PrabhuPay or any) for tickets to sporting events, concerts, and more.
  - For example, the mobile boarding pass allows you to use your smartphone or media tablet as your airline boarding pass at airport security checkpoints or at the gate during boarding.

# THANK YOU!