Unit 6

- XV6 OS
- Distributed OS
- Real time OS
- Mobile OS

Introduction to XV6 OS :

- Xv6 is a re-implementation of the Unix sixth edition.
- xv6 was developed by MIT as a teaching operating system for their “6.828” course.

XV6 OS

- Provides the basic interfaces introduced by Ken Thompson and Dennis Ritchie's Unix operating system, as well as mimicking Unix's internal design.
- Provides Process Management, synchronization, memory management, File Management Functionalities.

Uses :

- XV6 is used for teaching in many universities.
- It's also a tool OS for many program

Advantages :

- Very small codebase.
- Fairly modern.
- Fairly sophisticated.
- Fully functional.
- Easy to understand.

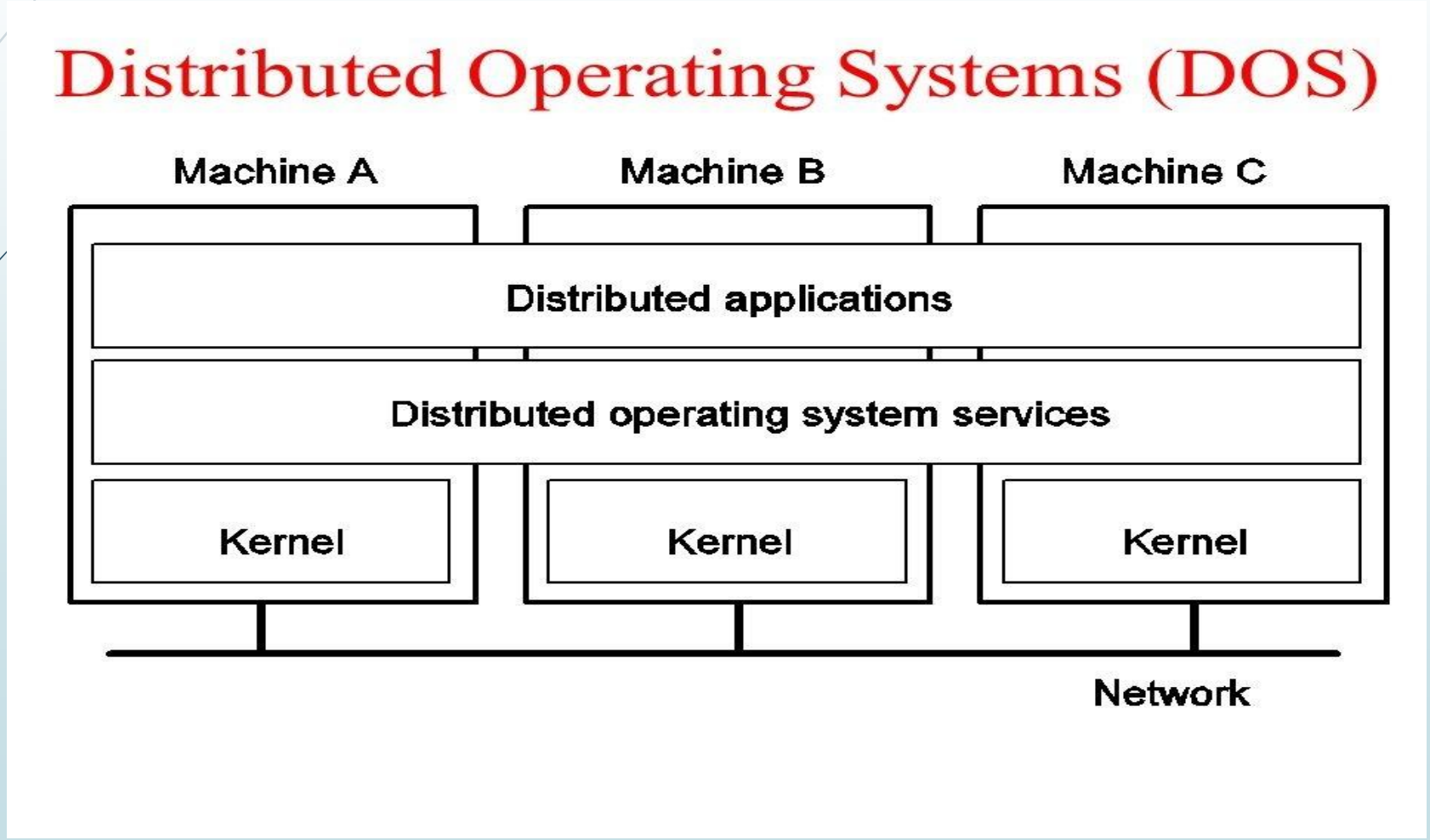
Disadvantages :

- Unlike Minix, Xv6 is a monolithic kernel, which means OS layers are not separated.
- Source is not separated either, furthermore kernel space code is mixed with user space code.

Distributed OS

- A distributed operating system is system software over a collection of independent, networked, communicating, and physically separate computational nodes. They handle jobs which are serviced by multiple CPUs.
- Multiple central processors are used by Distributed systems to serve multiple real-time applications and multiple users. Accordingly, Data processing jobs are distributed among the processors.
- Processors communicate with each other through various communication lines (like high-speed buses or telephone lines). These are known as **loosely coupled systems** or distributed systems. Processors in this system may vary in size and function. They are referred as sites, nodes, computers, and so on.

Distributed OS



Distributed OS

- A distributed operating system is one in which several computer systems connected through a single communication channel.
- These systems have their individual processors and memory.
- Data processing jobs are distributed between the processors.

Types

- Client-Server Systems
- Peer-to-Peer Systems
- Three-tier
- N-tier

Types

1) Client-Server Systems :

Client-Server Systems are also referred to as “Tightly Coupled Operating Systems”. This system function as a centralized server since they approve all requests issued by client systems.

2) Peer-to-Peer Systems :

The Peer-to-Peer System is known as a “Loosely Couple System”. This type of system contains nodes that are equal participants in data sharing, all the tasks are equally divided between all the nodes.

3) Three-tier :

The information about the client is stored in the middle tier, instead of storing it in the client. This architecture is most common in web applications.

4) N-tier :

N-tier systems are used when the server or application needs to forward requests to additional enterprise services on the network.

Application

- **In Telecommunication networks:** Useful in Phone networks and cellular networks.
- **Network applications:** Web and p-2-p networks as well as multiplayer web-based games.
- **Real-time process control:** Used in aircraft control systems and business control systems.

Distributed OS

- **Advantages**
- With resource sharing facility, a user at one site may be able to use the resources available at another.
- Speedup the exchange of data with one another via electronic mail.
- Failure of one site in a distributed system doesn't affect the others, the remaining sites can potentially continue operating.
- Better service to the customers.
- Reduction of the load on the host computer.
- Reduction of delays in data processing.

REAL TIME OPERATING SYSTEM

- **A real-time operating system (RTOS)** is a special-purpose operating system used in computers that has strict time constraints for any job to be performed.
- It responds to inputs immediately (Real-Time).
- Here the task is completed within a specified time delay.
- In real life situations like controlling traffic signal or a nuclear reactor or an aircraft.
- The operating system has respond quickly.

Real Time OS (RTOS)

- **Real time operating systems (RTOS)** are used in environments where a large number of events, mostly external to the computer system, must be accepted and processed in a short time or within certain deadlines. such applications are industrial control, telephone switching equipment, flight control, and real time simulations.
- The real time operating systems can be of 2 types –
- **Hard Real Time operating system**
- **Soft real time operating system:**

HARD RTOS

- A hard real-time system has time-critical deadlines that must be met; otherwise a catastrophic system failure can occur.
- Absolutely, positively, first time every time
- Requires formal verification/guarantees of being to always meet its hard deadlines (except for fatal errors).
- Examples:
  - air traffic control
  - vehicle subsystems control
  - Nuclear power plant control

SOFT RTOS

- In a soft real-time system, it is considered undesirable, but not catastrophic, if deadlines are occasionally missed.
- Also known as "best effort" systems
- Most modern operating systems can serve as the base for a soft real time systems.
- Examples:

  -multimedia transmission and reception,

  -networking, telecom (cellular) networks,

  -web sites and services

  -computer games.

Real Time OS (RTOS)

- Multitasking operation is accomplished by scheduling processes for execution independently of each other.
- Each process is assigned a certain level of priority that corresponds to the relative importance of the event that it services.
- The processor is allocated to the highest priority processes. This type of scheduling, called, priority based preemptive scheduling is used by real time systems.

Real Time OS (RTOS)

- **Advantages:**
  - **Maximum consumption –**
    Maximum utilization of devices and system. Thus more output from all the resources.
  - **Focus On Application –**
    Focus on running applications and less importance to applications which are in queue.
  - **Real Time Operating System In Embedded System –**
    Since size of programs are small, RTOS can also be embedded systems like in transport and others.
  - **Error Free –**
    These types of systems are error free.
  - **Memory Allocation –**
    Memory allocation is best managed in these type of systems.

ADVANTAGES OF RTOS

- RTOS can run on applications in any diverse and challenging environment conditions also.
- It runs efficiently even on very limited Hardware resources.
- It consumes less power and memory.

Real Time OS (RTOS)

- **Disadvantages:**
  - **Limited Tasks –**
    Very few task run at the same time and their concentration is very less on few applications to avoid errors.
  - **Use Heavy System Resources –**
    Sometimes the system resources are not so good and they are expensive as well.
  - **Complex Algorithms –**
    The algorithms are very complex and difficult for the designer to write on.
  - **Device Driver And Interrupt signals –**
    It needs specific device drivers and interrupt signals to response earliest to interrupts.

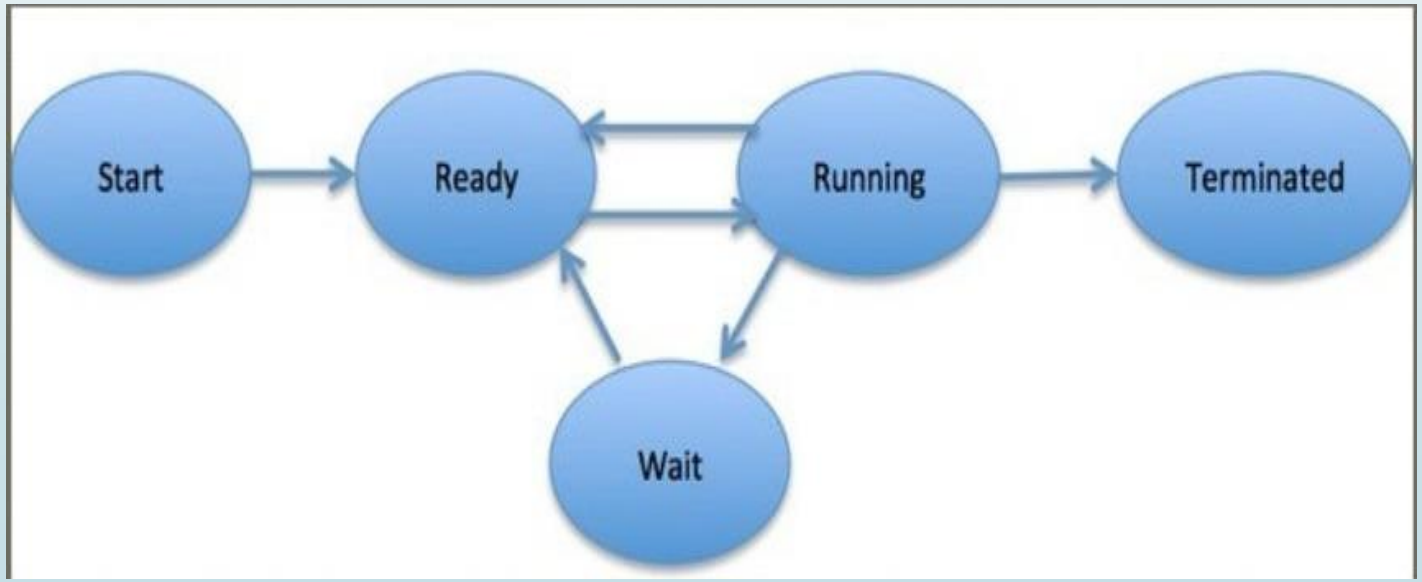
FUNCTIONS OF RTOS

- Task Management
- Scheduling
- Resource Allocation
- Interrupt Handling

TASK MANAGEMENT

- In Real Time Applications, any Process which takes a specified execution time and occupies predefined amount of memory is called as a Task.
- Task management is the process of managing tasks through its life cycle.

Task States Life Cycle



SCHEDULING IN RTOS

- Task management provides the following information about tasks:
  - No. of tasks
  - Resource Requirements
  - Release Time
  - Execution time
  - Deadlines
- RTOS Scheduler uses scheduling algorithms to organize them.

RESOURCE ALLOCATION

- We know that embedded systems have limited amount of resources in terms of memory & CPU power.
- So, it is essential to allocate the available resources efficiently.
- The same algorithms used for scheduling are again used for resource allocation.

INTERRUPT HANDLING

- Interrupt is any external control signal which disturbs the normal execution of a system.
- Interrupts cause the processor to suspend all other operations whatever it is doing & instead execute the code that will respond to the event which caused the interrupt.

APPLICATION OF RTOS

- Almost all the modern telecommunication systems make use of RTOS.
- Radar systems, network switching control systems, satellite monitoring systems, satellite launch-control and maneuvering mechanisms, global positioning systems all have their roots in RTOS.
- Now a days RTOS are increasingly finding use in strategic and military operations. These are used in guided missile launching units, track-and-trace spy satellites, etc.

Mobile OS

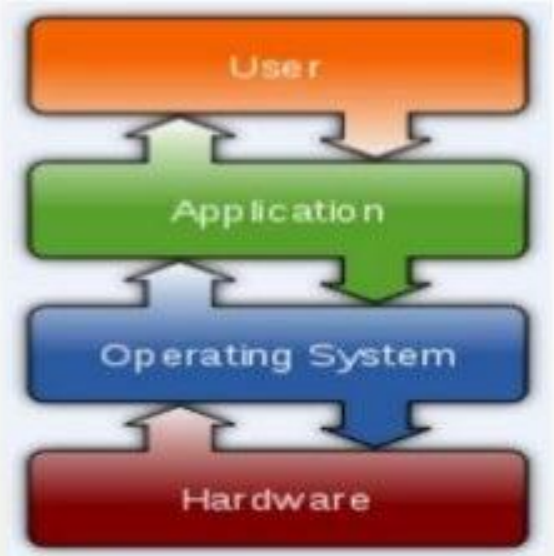
- A mobile operating system is an operating system that helps to run other application software on mobile devices. It is the same kind of software as the famous computer operating systems like Linux and Windows, but now they are light and simple to some extent.

- The operating systems found on smartphones include Symbian OS, iPhone OS, RIM's BlackBerry, Windows Mobile, Palm WebOS, Android, and Maemo. Android, WebOS, and Maemo are all derived from Linux. The iPhone OS originated from BSD and NeXTSTEP, which are related to Unix.

- It combines the beauty of computer and hand use devices. It typically contains a cellular built-in modem and SIM tray for telephony and internet connections. If you buy a mobile, the manufacturer company chooses the OS for that specific device.

What is Mobile Operating System ??

An operating system which controls mobile devices is called Mobile OS. Which is responsible for determining the functions and features available on mobile devices .



Various Types of Mobile Operating System

1. Symbian OS
2. Android OS
3. iPhone OS (iOS)
4. BlackBerry OS
5. Windows Phone

Symbian's Introduction

→The Symbian OS is produced by the software development and licensing **company OF Symbian Ltd**.This operating system used in **Nokia & sony ericsson** mobile

→ Symbian Ltd was established in **June 1998** and is headquartered in Southwark in the UK, and the current CEO **is Nigel Clifford.**

Evaluation of Symbian Operating system

- Strong Operating System
- Established value

- *Symbian was the most popular smartphone OS in the market back in 2010 with 37.6% of the sector's total sales .But now with the strong presence of the Android and iOS, the share of Symbian OS has been reduced to an all time low of 6.8%.*

Android ‘s Introduction

What is Android?

- Android is a **software platform** and **Operating System** for mobile devices
- Android was founded in **Palo Alto , California** in October 2003.
- **The founder of Android were Andy Rubin and Chris White.**
- Android acquired by Google on August 17, 2005.
- Android is based on the **Linux kernel Version 2.6.**
- Which developed by Google.

VERSIONS Of ANDROID

Version	*Name*	*Date Of Launch*
1. Android 1.0	Alpha	23rd Sept 2008
2. Android 1.1	Beta	9th Feb 2009
3. Android 1.5	CupCake	30th April 2009
4. Android 1.6	Donut	15th Sept 2009
5. Android 2.0 & 2.1	Éclair	26th Oct 2009
6. Android 2.2	Froyo	20th May 2010
7. Android 2.3	GingerBird	6th Dec 2010
8. Android 3.0	HoneyComb	22nd Feb 2011
9. Android 4.0	Ice Cream Sandwich	19th Oct 2011
10. Android 4.2	Jelly Bean	13th Nov 2012
11. Android 4.4.4	Kitkat	31st Oct 2013
12. Android 5.0	lollipop	12th Nov 2014
13. Android 6.0	Marshmallow	5th Oct 2015
14. Android 7.0	***Nougat***	22nd Aug 2016

Limitation Of Android OS

- Android Battery **Drain** Easily.
- Running Apps is forcely **close** if it too Large.
- It **heats** very easily.
- the phone itself has very **little memory storage**, so you have to keep large apps, videos, and photos on a card.

iOS's Introduction

- Team Members :-1.Steve Jobs 2.Steve Wozniak 3.Ronald Wayne
- **iOS** (known as **iPhone OS** prior to June 2010) is Apple's mobile operating system.
- **Apple is company who developed iPhone Operating System (iOS).**
- This OS is released on **June 29, 2007**.
- The latest mobile of Apple is Iphone13
- In this mobile phone ios15.4.1 operating System is used.

BlackBerry's Introduction

- BlackBerry OS Is a Mobile Operating System, Developed By Research In Motion For .Its Handheld Blackberry Smartphone Devices.

- The Operating System Provides multitasking .

- The track wheel, trackball, and most recently, the track pad and touch screen is one of its features.

- Blackberry also has its own messenger widely known as **BBM**. which we can share messages, images, videos etc

Windows's Introduction

- ✓Windows operating system is only use in windows phone which is developed by **Microsoft..**
- ✓The current version is **"Windows Mobile 10"**. Which was made available in the market since 21st Jan 2015.