UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING

SESSION 2024/2025 SEMESTER 2

COURSE CODE

SECP1513 – Technology & Information System

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CHAPTER 3: SOFTWARE (Open-Ended Questions)

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Open -Ended Questions

1. Describe system software. Discuss each of the four types of system programs.

Answer:

System software is a program designed to run a computer's hardware and applications and manage its resources, such as its memory, processors, and devices. It also provides a platform for running application software, and typically bundled with a computer's operating system.

Four types of system program:

i. **Operating System**
   - Operating System are most important type of system software that controls how hardware works by managing the computer memory, processes and all of its software and hardware.

ii. **Device Drivers**
   - Device drivers are tiny programs that enable a computer to communicate with its hardware devices, such as printers, scanners, and keyboards. Without device drivers, the hardware connected to computer will not be working properly. Drivers for these devices are provided by its manufacturer or provided by Operating System providers for some generic devices.

iii. **Utilities**
   - Utilities are programs that helps maintain and optimize a computers performance. Example of utilities are file managers, virus scanner and disk defragmenters and usually these are bundled with the operating system or can be downloaded from internet.

iv. Programming language translators

- Programming language translator will convert high-level or assembly programming language which readable by human into a form where computer's hardware can understand. Examples, C++ compiler, Python interpreter or Assembler.
- This translation enables the execution of software written by programmers using human readable language.

2. Define operating systems. Describe the basics features and the three categories of operating systems.

Answer:

Operating system are collection of programs that handles technical tasks such as functions, provides user interface and runs applications. Its controls how hardware works by managing the computer memory, processes and all of its software and hardware.

Basic features of an Operating System are:

i. Booting which is starting or restarting the computer.
ii. Features in common with application software such as icons, pointers, windows, menus, tabs, dialog boxes, Help and Gesture controls.
iii. Files and Folders where files share data and programs while folders store related files.

Three categories of Operating System are:

i. Embedded operating systems-RTOS (Real-time operating system) such as Smartphones, Smartwatches or Video game systems.
ii. Stand-Alone Operating System which is also called as desktop Operating System.
iii. Networking Operating System for linked computers such as Windows Server, Unix and Linux. For this type of Operating System, it is stored on network server which coordinates all communication between the other computers.

3. What are mobile operating systems? Describe leading mobile operating systems.

Answer:

Mobile Operating Systems are embedded operating systems designed to run on smartphones, tablets, smartwatches and other mobile devices. This type of Operating Systems are less complicated and more specialized for wireless. They managed both the hardware and software resources of these devices while also providing a user interface and allowing apps to run.

Leading Mobile Operating System:

- **Android** – Developed by Google, and it is based on Linux kernel. Android is open-source with proprietary additions from Google such as Google Play service. User can download app from its own App Store called Google Play Store.

  Key features of Android:

  i. Highly customize interface
  ii. Wide variety of devices such as Samsung, OnePlus, Xiaomi and etc.
  iii. Ability for Google Assistant integration.
  iv. Multi-tasking, widgets and strong app ecosystem.

- **iOS -** Developed by Apple Inc and it is exclusively for Apple devices likes iPhone or iPad which use iPadOS variant. User need use Apple App Store to download apps.

  Key features of iOS:

  i. Seamless ecosystem integration between various Apple devices such as iPhone, iPad, Apple Watch or with Apple laptop Mac.
  ii. High security and privacy controls
  iii. Regular updates across all devices.
  iv. Optimized performance and user-friendly design.

- **HarmonyOS** – Developed by Huawei for Huawei mobile devices. User can download app from Huawei App Store.

  Key Feature of HarmonyOS:

  i. Cross-device integration between Huawei devices such as smartphones, smart watch, Smart TV.

  ii. Optimized performance and user-friendly design.

4. What are desktop operating systems? Compare Window, Mac OS, Linux and Chrome OS. Discuss virtualization.

Answer:

A desktop Operating System is a system software designed to run on personal computers such as desktops, laptops and workstations. It provides a user interface, that allows user to interact with the hardware and software through a graphical interface, usually through input devices such as mouse and keyboards. Desktop operating system also manage hardware resources, enables file management and support application execution. Examples of desktop operating system are Windows, MacOS, Unix, Linux and Google Chrome OS.

Comparison between Windows, Mac OS, Linux and Chrome OS are listed in below table:

Features	Windows	Mac OS	Linux	Chrome OS
Developer	Microsoft	Apple	Open-source community (kernel by Linus Torvalds)	Google
Source Code	Proprietary	Proprietary	Open-Source	Closed source with open-source parts
Base OS	Windows NT	Unix-based	Unix-like (GNU/Linux)	Linux-based
Typical Devices	Desktops, laptops, tablets	Apple Macs	PCs, servers, embedded systems	Chromebooks

Features	Windows	Mac OS	Linux	Chrome OS
User Interface	Graphical interface with Start Menu	Sleek interface with Dock	Varies (GNOME, KDE,etc)	Minimalistic, browser-based GUI
Multi-user	Yes	Yes	Yes	Yes
File System	NTFS, exFAT	APFS (Apple File System), HFS+	Ext4, Btrfs, XFS, etc.	Ext4 (hidden from user)
Memory Management	Virtual memory, paging	Virtual memory, memory compression	Efficient, customizable swap	Optimized for lightweight usage.
Malware Resistance	Moderate (antivirus recommended)	High	Very High (low target rate)	Very high (sandboxing, auto-updates)
Boot Time	Medium	Fast	Very Fast	Very Fast
Hardware Support	Broad, OEM drivers	Apply only hardware	Broad (some setup needed)	Chromebook-specific
Speed and Performance	Slows over time, depends on specs	Smooth and optimized on Apple hardware	Can be extremely fast	Speeds is determined by the speed of Internet.
Cost	Paid (license or pre-installed)	Free (Came with Apple devices)	Free (Open Source)	Free with device purchase.
Best Use Case	General users, gamers, office environments	Creatives, Mac users, professionals	Developers, tech enthusiasts, servers.	Student, light users, cloud-based work

Desktop Operating System comparison summary:

Each desktop operating system serves different user needs. Windows is widely used and compatible with most software. Mac OS is ideal for users in the Apple ecosystem while Linux offers high performance and flexibility for developers and power users. Chrome OS is lightweight and best suited for internet-based tasks and education purpose.

Virtualization Discussion:

Virtualization is a technology that allows multiple operating systems to run on a single physical machine through virtual machines. Each virtual machine appears as a separate independent computer.

- **Virtual Machines (VMs**) – Is a virtual environment that simulates a physical computer. Each VM runs its own operating system and applications, and it can be configured with different amounts of resources like CPU, memory and storage.

- **Hypervisor** – Is a software or firmware that manages virtual machines and their resources by acting as bridge between the physical hardware and the VMs, allowing them to access the resources. Examples such as VirtualBox, VMware or Hyper-V.

Key benefits of virtualization:

- Allows users to run Windows in a Mac OS, or Linux on Windows, for testing and development.
- Saves cost and space by reducing the need for multiple physical machines.
- Increases flexibility in software development, security testing, and system education.

5. Discuss utilities. What are the most essential utilities? What is a utility suite?

Answer:

Utilities are specialized software programs that help maintains, optimized, and managed a computer systems functionality. They are designed to assists user wit task like backing up data, fixing errors, and enhancing performance.

Most Essential Utilities:

i. Troubleshooting or diagnostic programs – Recognized and correct programs.
ii. Antivirus programs – Guard your computer against viruses.
iii. Backup programs – Copies of files to restore if necessary
iv. File compression programs – Reduce the size of files for more efficient storage.

Utility Suite:

- Utility suite is combing several programs into one package to help manage, maintain, and optimized the computer system and its resources. Those built in tools in operating system are Disk Cleanup, Task Manager, File Explorer and System Resource while popular third-party utility suites are Bit Defender, Norton Utilities and Kaspersky.

- Utility suites helps to keep system running efficiently, securely and reliably by preventing system crashes, detect problems early and improve performance.

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