

## IT Fundamentals

CHAPTER 4: OPERATING SYSTEMS

#### Operating System Fundamentals

- ► Differences between:
  - Operating system
  - Application
  - Driver

## Brief History of OSs

Pre-OS

- ► The Early OSs
- Standardization
- Modern OSs



## **Basic OS Definitions**

- Kernel
- Version
- Source
- Shell
- Graphical User Interface (GUI)
- Cooperative multitasking
- Preemptive multitasking
- Multithreading
- 32-bit vs. 64-bit

## Compatibility

- ► Hardware compatibility
  - ▶ 32-bit vs. 64-bit
- Software compatibility



## Core OS functions



# Coordinating users and hardware



Provide environment for software to function



Provide structure for data management

Monitor system health and functionality

#### Types of Operating Systems

- Workstation
  - Linux
  - Mac OS
  - Windows
  - Chrome OS
- Server
  - Linux-based
  - Mac-based
  - Windows-based

- Mobile
  - ► Apple iOS
  - Android
  - Windows Mobile
- Virtual
- Embedded

## Linux

Developed in 1991

- Open source
- Many versions
- Uncommon for workstations
- Very popular for servers



#### Mac OS



- Introduced in 1984 by Apple
  - "System Software"
- First common GUI
- Current version is macOS, which followed OS X
  - Version names based on big cats or now California locations
- Proprietary to Mac computers
- Loyal users
- Considered the best for graphics programs

#### Windows



- Launched by Microsoft in 1985
- Most widely-used workstation
   OS in the world
- Closed source

## Chrome OS



- ► Google launched in 2011
- Installed on Chromebooks
- Designed to be lightweight
  - Based on the Chrome browser
  - Very little local storage uses the cloud
- Versions updated automatically

## Apple iOS



- Launched in 2007 with the first iPhone
- Proprietary to Apple devices
  - ▶ iPad, iPhone, iPod
- Very popular

#### Android



- Launched by Google in 2008
- Not open source, but crossplatform; supported by many hardware vendors
- Biggest OS install base in the world

## Windows Mobile



- Developed by Microsoft
- Current look/feellaunchedin 2010
- Look and feel similar to Windows on a workstation
- Not very popular
- Microsoft stopped developing it in 2017

## Virtual OSs

- Multiple OSs running concurrently on one physical computer
  - Virtualization
- Virtual machine (VM)
- Critical for cloud computing
- Hypervisor enables virtualization
  - Type 1 bare-metal hypervisor
  - ▶ Type 2 sits on an existing OS

#### Embedded OSs



- Designed to be small and efficient
  - Often responsible for a single task
- Firmware is an example
- Used in very small devices such as wristwatches and children's toys
- Typically not upgradeable



## **Operating Systems**

#### Things Operating Systems Manage

- User accounts
- Access control
- Applications
- Processes
- Services
- Devices
- Disk space
- Memory
- Files, folders, and permissions

#### User Accounts

- Gives user access to the computer
- Determines which resources the user can access, and what the user can do with them
- Administrator, User, Guest



#### Access Control



- Security in place to control system configuration changes
- Microsoft implements it with User Account Control (UAC)

#### **Application Management**

Windows Registry

- Compartmentalized installation and easy uninstallation
- Windows uses Programs and Features in Control Panel



## Process Management

- Every task on a computer is run as a process
- If the process hangs (freezes), user can stop (or kill) it
- Windows Task Manager

| Processi Prestazioni Cronolog | gia applicazioni Avvio Utenti | Dettagli Servi | zi             |             |            |           |            |              |                  |
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| > AMD External Events Ser     | vice Mo                       | 0%             | 0,1 MB         | 0 MB/s      | 0 Mbps     | 0%        |            | Molto basso  | Molto basso      |
| > 💽 Antimalware Service Exe   | cutable                       | 0%             | 57,3 MB        | 0 MB/s      | 0 Mbps     | 0%        |            | Molto basso  | Molto basso      |
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#### Service Management

| Services (Local) | 9 Services (Local)   |  |   |  |  |                                      |                                  |   |  |  |
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|                  | Windows Installer  | Name   |   | Description Status                             |  | Startup Type                         | Log On As                        |   |  |  |
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|                  |  |  | General Log On  | ties   |  | lau                                  | Local System<br>Local Service    |   |  |  |
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|                  |  |  | Startup type: Manual +  |  |  |                                      | ematic                           | Local Service                                 |  |  |
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|                  |  | Wireld AutoConfig  |   |  | The Wired  | (and a state                         | Manual<br>Manual                 | Local System                                  |  |  |
|                  |  | White Performance Adapter  |   |  | The WLANS Started<br>Provides pe   | Manual                               | Local System                     |   |  |  |
|                  |  | Workstation     Workstation     World Wide Web Publishing Service  |   |  | Provides W., Started   | AUCOHISTIC                           | INSTRUCTION OF A DELAIS          |   |  |  |

- Services extend computer functionality, such as by managing print requests
- Can start automatically at startup, or need to be manually started
- Services management console in Windows used to start, stop, and configure

#### Device Management

- Manage hardware devices, including installing and updating drivers
- Device Manager in Windows

#### Disk Management

| Æ   |  |  |   | Computer Management   |   |   |  |  |
|---|--|--|---|---|---|---|--|--|
| File Action View Help   |  |  |   |   |   |   |  |  |
| (= =) 🖄 🔝 🔝 😣   |  |  |   |   |   |   |  |  |
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|   | Dick 2<br>Basic<br>297.97 GB<br>Online   | Windows 10 (E)<br>297.96 GB NTFS<br>Healthy (Boot, Page File, Crat   | ih Dump, Primary Parti  | tion)   |   |   |  |  |
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|   |  |  |   |   | _   | _   |  |  |

- Manages hard drives, optical drives, other storage media
- Creating and deleting partitions
- Formatting partitions
- Windows uses Disk Management console

#### Memory Management

- OS manages physical memory
- Virtual memory (hard drive space) used as a backup
  - Swap file or page file
  - Virtual memory manager

## Managing Folders and Files



- File systems manage:
  - Disk space and file access
  - File names and directories (folders)
  - File metadata
  - Security

## Common File Systems









## Navigating a File System

- Search, sort, and display files
- Identify file and folder size
- Understand file and folder permissions
- Read-only versus modifiable files

## Manipulating Files

- Open
- Edit
- Save
- Move
- Copy
- Cut
- Paste
- Delete
- Rename

## Programs and Shortcuts

- How to execute a program
- Differences between shortcuts and applications

## Chapter 4: Operating Systems

- Manage applications and software
  - Interface between applications and hardware
  - Disk management
  - Process management/ scheduling
    - ► Kill process/end task
  - ► Application management
  - Memory management
  - Device management
  - Access control/protection
  - Types of OS
    - Mobile Device OS
    - ► Workstation OS
    - Server OS
    - Embedded OS
      - Firmware
    - Hypervisor (Type 1)

- Compare and contrast components of an operating system
  - File systems and features
    - File systems
      - NTFS
      - ► FAT32
      - ► HFS
      - Ext 4
    - Feat ures
      - Compression
      - Encryption
      - Permissions
      - Journaling
      - Limit ations
      - Naming rules
    - File management
      - Folders/direct ories
      - File types and extensions
      - Permissions
    - Services
    - Processes
    - Drivers
    - Utilities
      - Task scheduling
    - Interfaces
      - Console/command line
      - ▶ GUI