



IT Fundamentals

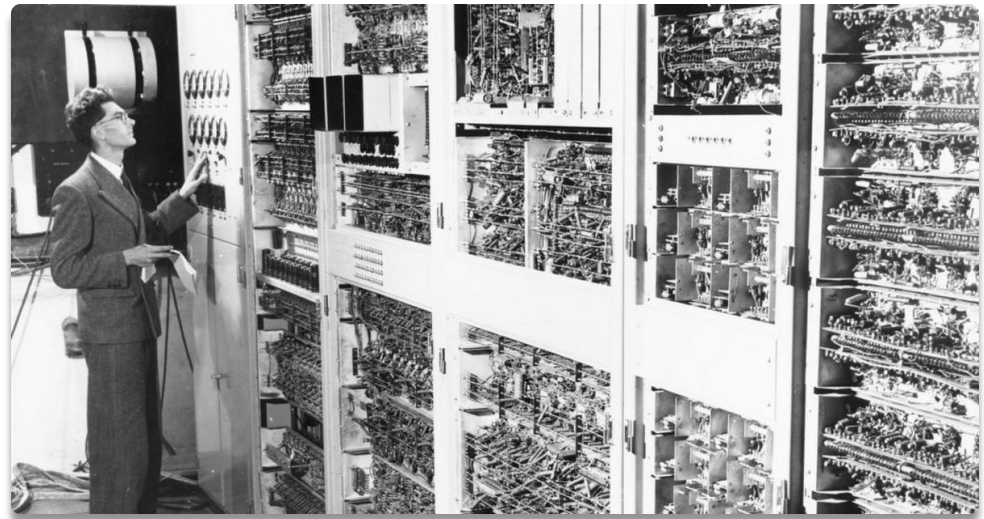
CHAPTER 4:
OPERATING SYSTEMS

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 v.s. 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 cross-platform; supported by many hardware vendors
- ▶ Biggest OS install base in the world

Windows Mobile



- ▶ Developed by Microsoft
- ▶ Current look/feel launched in 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



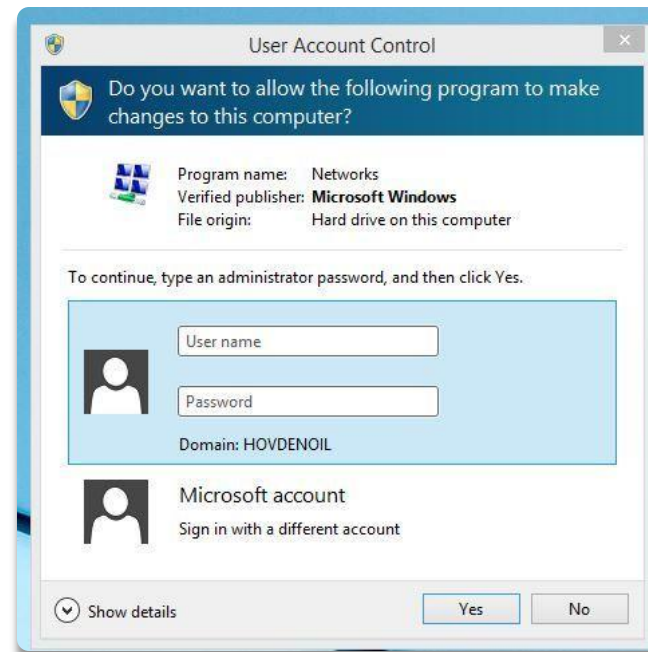
Operating Systems

Things Operating Systems Manage

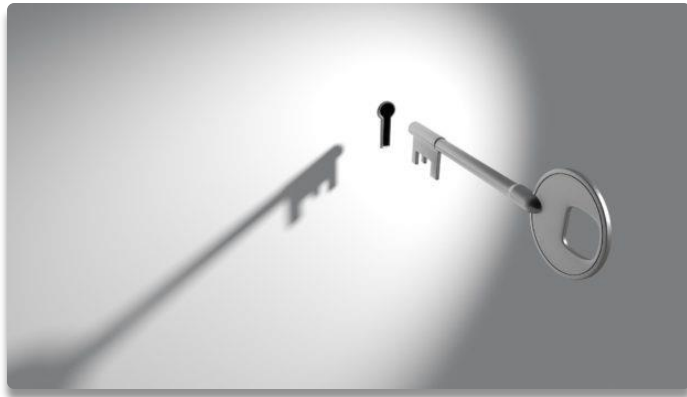
- ▶ User accounts
- ▶ Access control
- ▶ Applications
- ▶ Processes
- ▶ Services
- ▶ Devices
- ▶ Disk space
- ▶ Memory
- ▶ Files, folders, and permissions

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



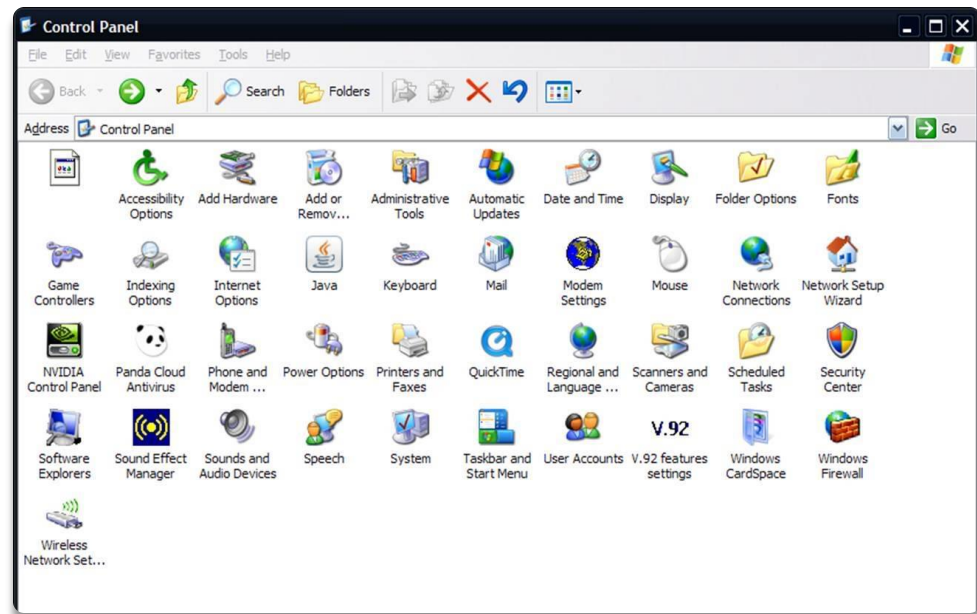
Access Control



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

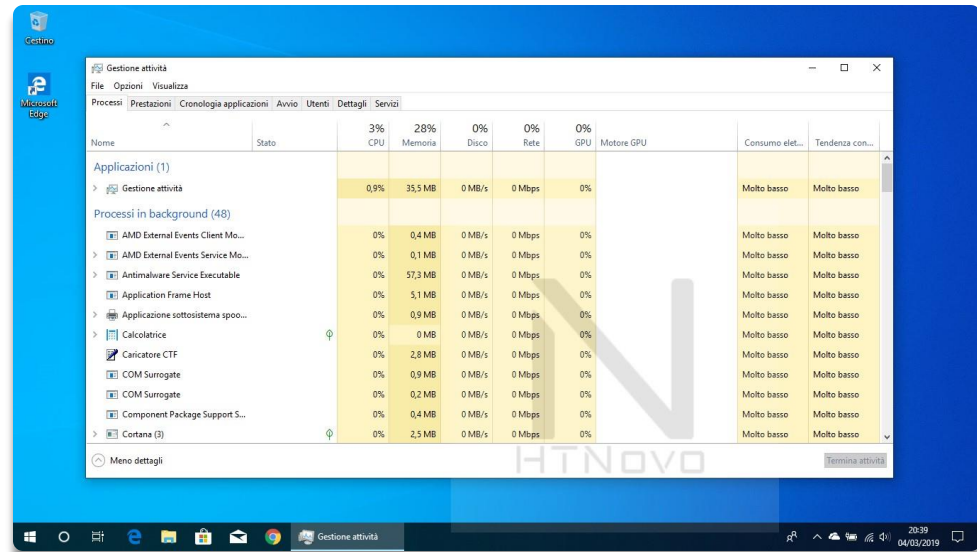
Application Management

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

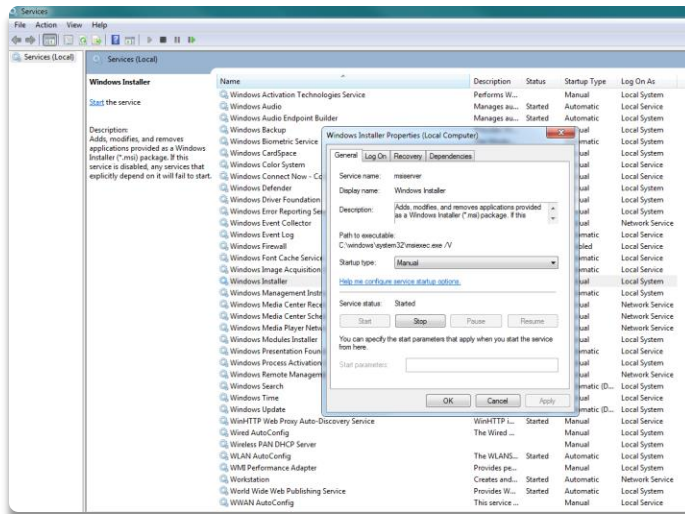


Process Management

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

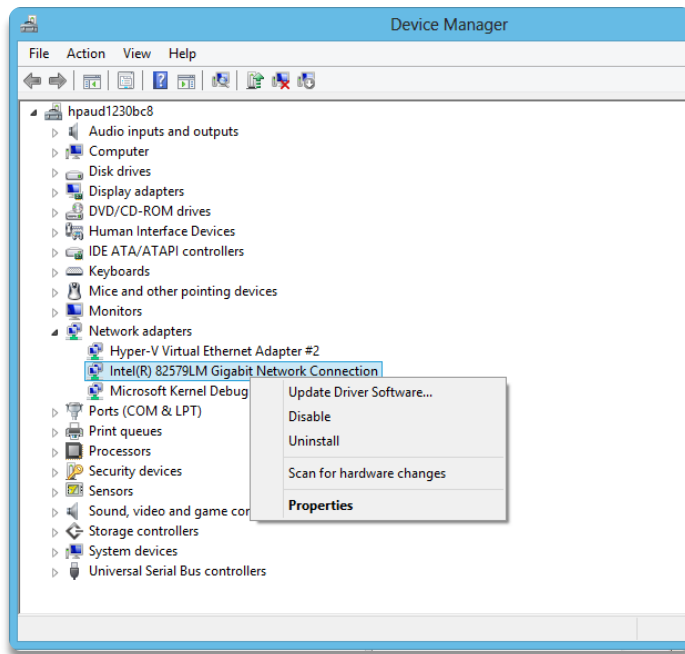


Service Management



- ▶ 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

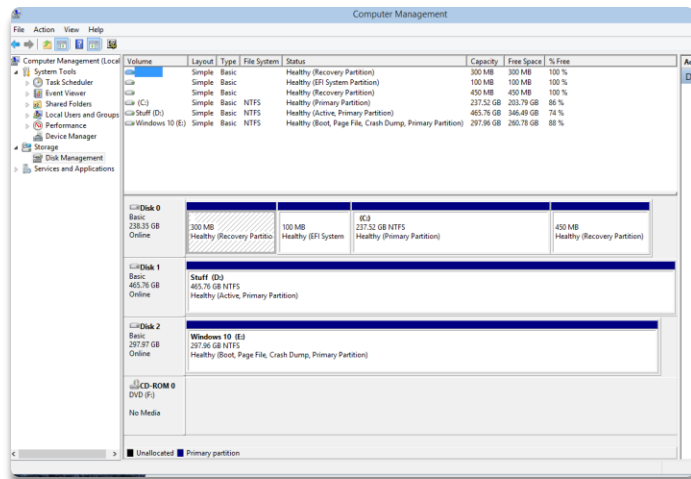
Device Management



- ▶ Manage hardware devices, including installing and updating drivers

- ▶ Device Manager in Windows

Disk Management

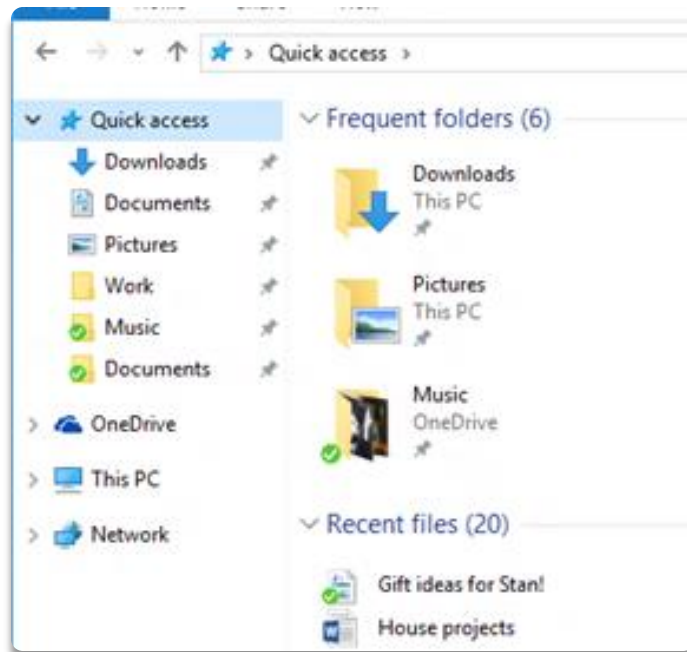


- ▶ Manages hard drives, optical drives, other storage media
- ▶ Creating and deleting partitions
- ▶ Formatting partitions
- ▶ Windows uses Disk Management console

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

- ▶ FAT

- ▶ NTFS

- ▶ HFS

- ▶ Ext4

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
 - ▶ Features
 - ▶ Compression
 - ▶ Encryption
 - ▶ Permissions
 - ▶ Journaling
 - ▶ Limitations
 - ▶ Naming rules
 - ▶ File management
 - ▶ Folders/directories
 - ▶ File types and extensions
 - ▶ Permissions
 - ▶ Services
 - ▶ Processes
 - ▶ Drivers
 - ▶ Utilities
 - ▶ Task scheduling
 - ▶ Interfaces
 - ▶ Console/command line
 - ▶ GUI