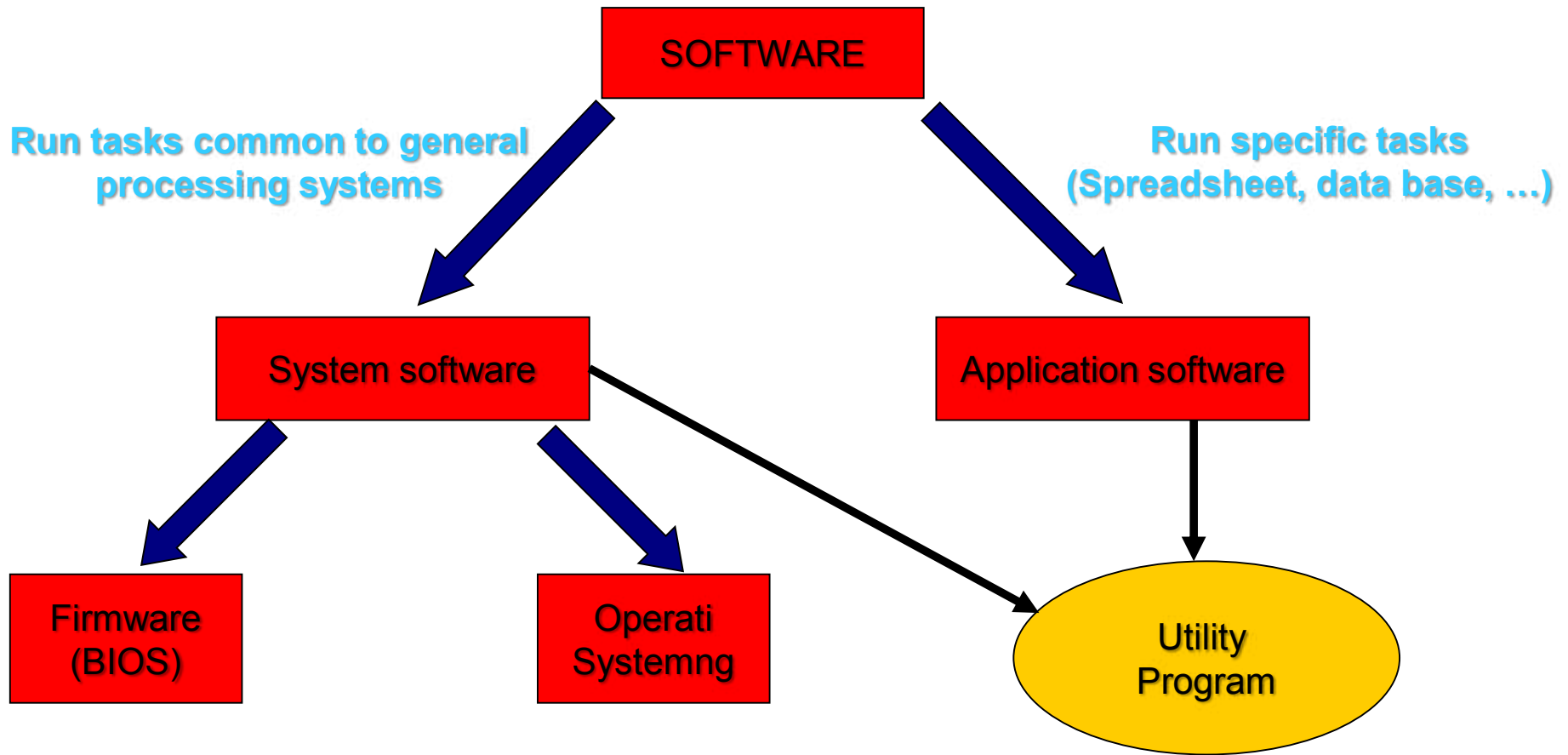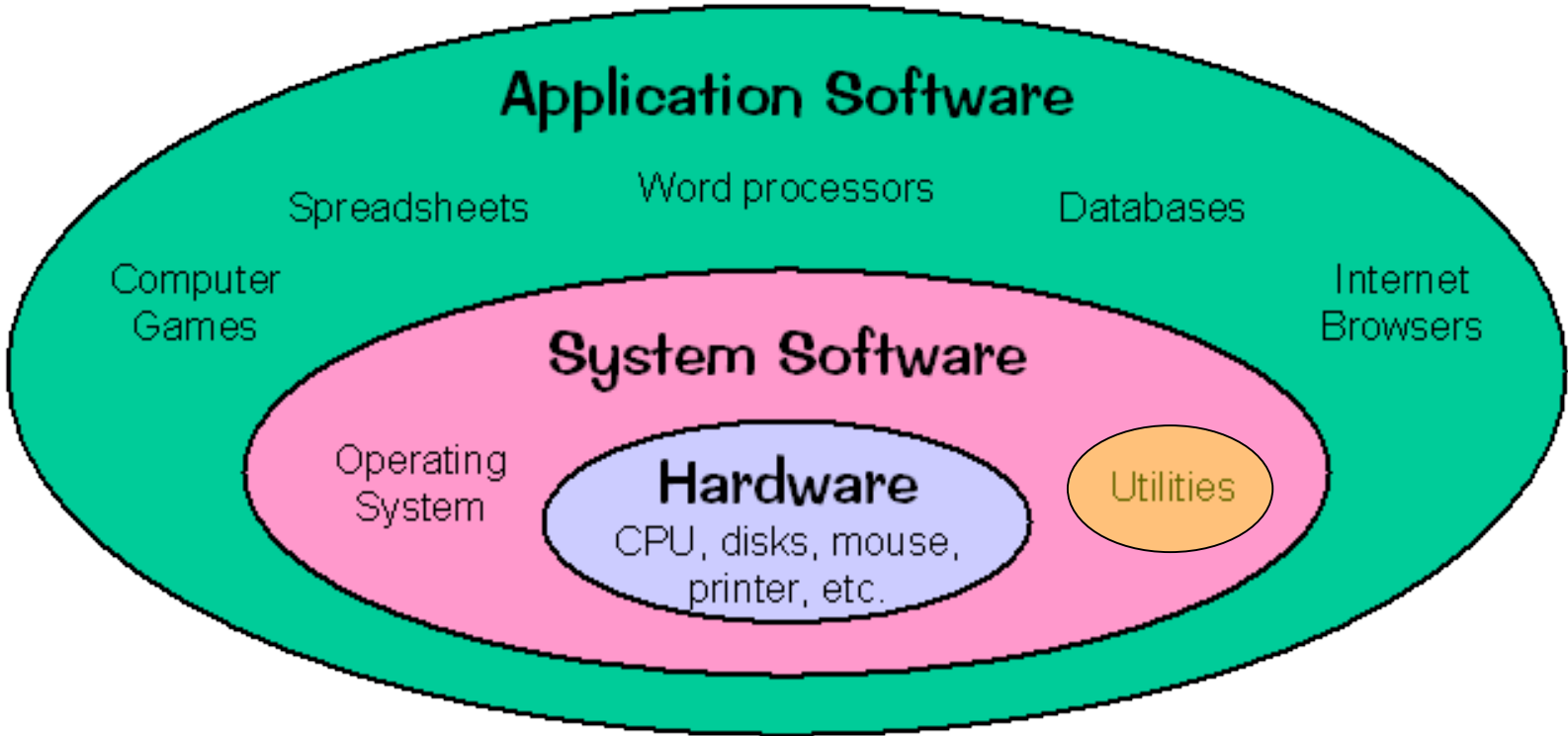# Software and OS

CdL Medicina Veterinaria

Software

- Set of instructions and programs that make the computer operate

- Software indicates to the hardware which operations must be executed to carry out a task

- Can be divide into
  - System software
  - Application software
  - Utility software

Software classification

SOFTWARE

Run tasks common to general processing systems

Run specific tasks (Spreadsheet, data base, …)

System software

Application software

Firmware (BIOS)

Operati Systemng

Utility Program

Software

Application Software

Spreadsheets Word processors Databases

Computer Games Internet Browsers

System Software

Operating System Hardware — CPU, disks, mouse, printer, etc. Utilities

System Software

- Basic tasks for the system
  - Firmware
  - Operating system (Drivers, compilers, interpreters...)
- **Firmware**: set of instructions integrated into an electronic component
  - Used to start the PC
  - Not modifiable by user
  - Most famous is the mother board one: BIOS (Basic Input/Output System), first program executed at boot
  - BIOS is used to configure some Hardware

System Software

- **Operating system**:
  - Manage computer components and provide an interface between computer and users
  - Guarantee basic operations of the system

System software

- **Driver:** set of procedures that permit to operating system to drive an hardware device
  - OS can use a component without detailed information on how it works
  - Dialog with OS is through a standart interface

- **Compilers and interpreters:**
  - Compilers translate instruction from programing language into machine language (object code)
  - Interpreters execute operations without translation

Application Software

- Solve a specific problem
- Programs that manage a user specific task
- Autonomous by operating system
- Can be general purpose (office suite, project, publishing, multimedia, …) or specific (warehouse management, salary management, …)

Utility program

- Manage specific task of the sytem
  - Can integrate both OS and applications
  - Antivirus
  - Diagnostic
  - Disinstallation
  - Backup
  - Formatting
  - …

Operating system

- Manage processing resources
- Check that the operations are executed in quick and regular way
- Manage:
  - Operation of the different components inside a computer
  - Communication between different components
  - User interface
  - Access to processing and memory resources
- Each application use computer resources through the OS
- Accept tasks to be executed and send them to execution

Operati syngstem

Manage basic operation of computer:

- File read and write
- Load programs to execute
- Memory management
- Manage input/output device
- Communication between computers (network)
- Manage users

OS is a layer between user and hardware, that has the goal to provide an environment in which the user can execute programs in efficent and safe way

Operating system

- Can be classified according to:
  - mono/multi-tasking
    - Ability to manage more than one task simultaneously
  - mono/multi-threading
    - Support tasks which have more than one operation flow
  - Mono/multi users
  - Textual/graphical interface

Operating system

- Operating system for desktop :
  - Linux
  - MS Windows
  - MacOS

- Operating system for smartphone/tablet:
  - Android
  - MS Windows
  - IOS
  - (Linux)

User interface

- Manage User-Machine Interaction
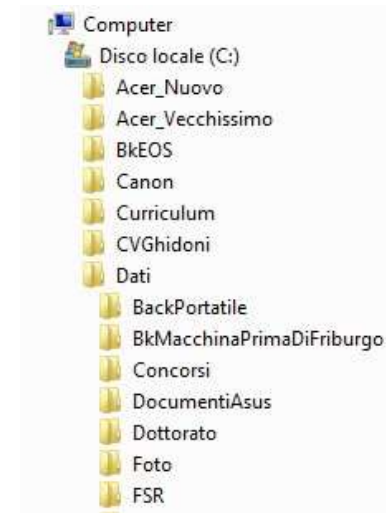- Textual

- Graphical

User interface

- It is usually (not always) indipendent by OS

- Graphical Interface (GUI)
  - Overlapping windows
  - Point and click to manage applications software
  - Same commands for every programs

- Other interfaces: touchscreen, voice recognition, stylus, ...

Data organization

- Data are organized in:
  - Files
    - Logical container identified by a name
  - Folders (directories)
- Tree representation of *file system*
  - Each node is a directory
- A tree for each disk partition (multi-root)
- File type is identified by the extension (.pdf, .doc, .exe…)

Computer
Disco locale (C:)
Acer_Nuovo
Acer_Vecchissimo
BkEOS
Canon
Curriculum
CVGhidoni
Dati
BackPortatile
BkMacchinaPrimaDiFriburgo
Concorsi
DocumentiAsus
Dottorato
Foto
FSR

Resource management

- Distribute available resources to applications (CPU, RAM, peripherals)
- Avoid malfunctioning due to simultaneous use of resources
  - E.g. multiple access to printer can cause bad print
- Optimize performances, using criteria which allow to use all the resources of the computer

Authentication

- In modern OS:
  - Authentication using username and password
  - File property (each file has its owner)
  - File permission (user, group and all, can have access to read, write, and execution)
- Two different user types: user and super-user

Data compression

- Methods to reduce files size
  - PK-ZIP
  - 7ZIP
  - GZIP
- It is possible to encrypt compressed files
- Useful to send files
- Not all files can be compressed with the same compression ratio
- Automatic compression utilities are present in OS

Computer Virus

- Different kind of virus can bring to:
  - Loss of data
  - Share of private data
  - E-mail address book diffusion
  - Loss of control on the OS
  - …

Computer Virus

- A **virus** is a malicious program which uses another program as a vehicle for dissemination and replication

- A **trojan** (Trojan Horse) is a program that pretends to be useful to the user, masquerading as something else.
  - some trojans appear initially as codecs for playback of multimedia content

- a **worm** is a malicious program that can reproduce itself without needing to be conveying by another program

- A **toolkit** can be malicious or not.
  - In the first case it refers to libraries that replace or complement the libraries of the OS or of the programs to cause damage, hiding in order to escape the attention of the user.
  - When a toolkit involves the operating system kernel (such as fake driver), it is called **rootkits**.
  - installs a backdoor

Antivirus

- Programs which prevent virus introduction in the system
  - Scan at boot
  - Scan at file access
  - Scan at application start
- Free antivirus for personal use
  - Avast!
  - Avira

Linux and virus

- Linux is less attacked by virus:
  - Application programs are better separated by utility programs
  - Is open source: anyone can signal and fix a problem and security is not based on the idea that no one know the code
  - Has a permission and authentication mechanism that make it more robust

Application program

- Goal: resolve a specific task
- Use OS to access the resources
- The use of applications is one of the main goal of the users
- A lot of different software on the same hardware (general purpose…)

Frequently used applications

- MS Office / OpenOffice
  - Word processing
  - Spreadsheet
  - Presentation
- Web browser
- E-mail client

Free software

- The use of almost every software is under license
  - Not always means that you must pay
- Some software can be used for free legaly
  - Operating systems
  - Office suites
  - Image processing
  - ...

Free software

- Advantages:
  - It is free of charge
  - Open user community: it is easy to find help
  - High quality
- Disadvantages:
  - More difficult to use (less than in the past)
  - No professional support
  - Often licenses impose to release for free software that use free libraries
  - Often software is free only for non-commercial use

Free software

- **Free software** is used together with **open source software** to indicate software that the user can run, copy, distribute, study, change, and improve for free.

Freeware, shareware, commercial

- **freeware** is commonly used for software that can be ditributed but not modified and which source code is not available.
  - This kind of software is not free software

- **shareware** is a software that allows copies distribution, but impose to pay a license, after a fixed date

- **Commercial software** is a software developed by a company with the aim of earn by its diffusion