Hardware, software and computer security

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Obsah prezentácie:

1. Technical equipment of computers – Hardware
2. Software equipment of computers – Software
3. Information Security

A computer is an electronic device for processing information that enables the execution of programs, the input and display of output information.

1. Technical equipment of computers – Hardware

- All technical components of the computer

  (motherboard, microprocessor, memory, source, graphic card, disk drives) – form the basic unit

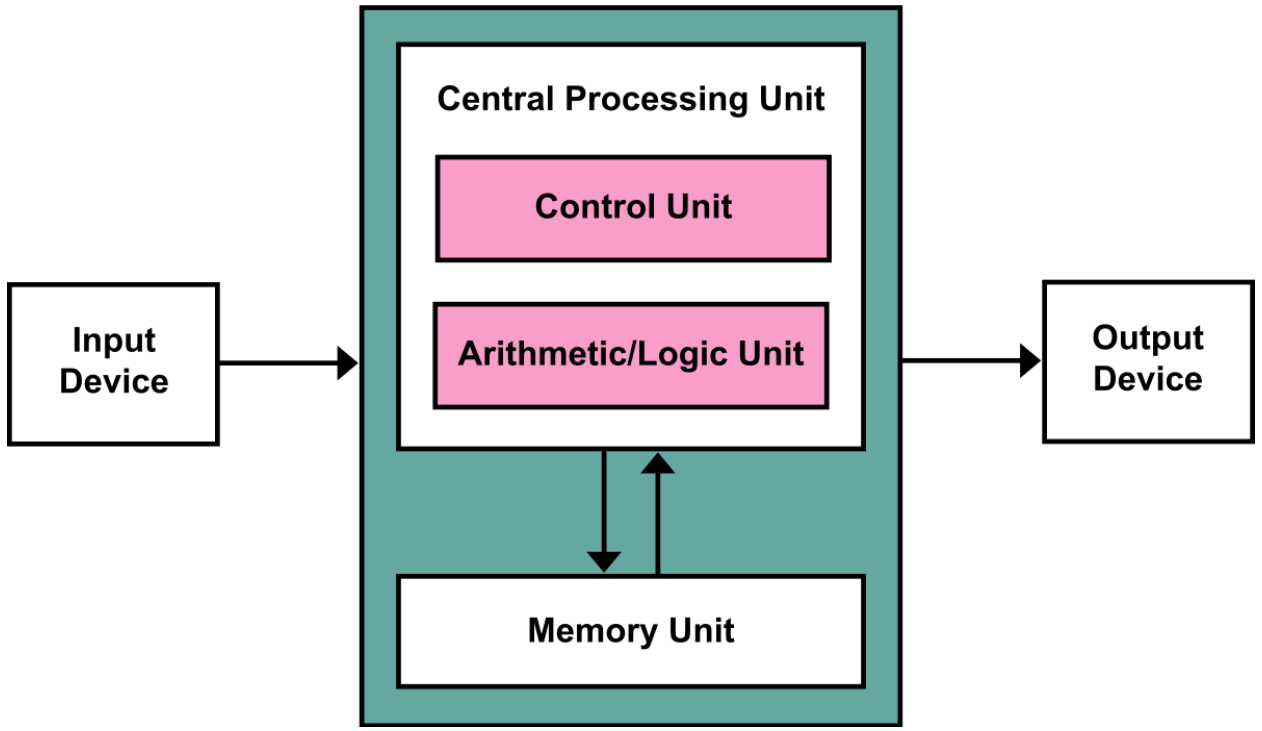
- Hardware also includes **INPUT** and **OUTPUT** devices

- All computers work on the same principle (tablet, PC, mobile phone, ...) - John Von Neumann scheme (1945) (American mathematician of Hungarian origin)

Von Neumann computer scheme

- **Input devices**
- **Output devices**
- **Processor** – CPU (Central Processing Unit) – central processing unit - interprets, executes and processes program instructions or data. It consists of a **controller** and an **arithmetic logic unit**.
  - ***Controller –*** A device that allocates computer resources to individual operations based on a specified set of instructions. It controls the operation of the computer, i.e. the ALU.
  - **Arithmetic logic unit** (ALU) - the part of the processor in which all arithmetic and logical operations take place. Contains blocks for arithmetic and logical operations. Its task is to execute the program stored in memory step by step.
- **Operating memory** – temporary storage of the processed program, processed data and calculation results.
- **Bus** – (like USB – Universal Serial Bus) system of conductors (conductive path system) – connects individual parts of the computer by means of electrical impulses.

Von Neumanno computer scheme



- A program (a sequence of instructions that are sequentially executed by the ALU) from the input devices is written into the memory via the ALU. In this way, the input data required by the program is also written into the memory.
- A custom calculation will take place, which is gradually performed by the ALU. This unit is controlled by a controller, while storing intermediate results in memory.
- After the program is finished, the results are checked and sent to the output device.

Communication between computer parts

It is divided into three parts:

- **Controller control signals** – with these signals, the controller sells its requests to other devices.
- **Status messages for the controller** – these signals are basically a response to control signals. With them, the device provides information to the controller about the successful/unsuccessful execution of the required operation, or provides additional information requested by the controller.
- **Data flow** – represents the data itself flowing from input devices through the ALU to memory or output devices.

The division of computers and the basic assembly of a computer

- Division by size, performance and purpose:
  - Personal computers (PC) (desktop, portable),
  - Working stations,
  - High-performance computers,
  - technological computers.

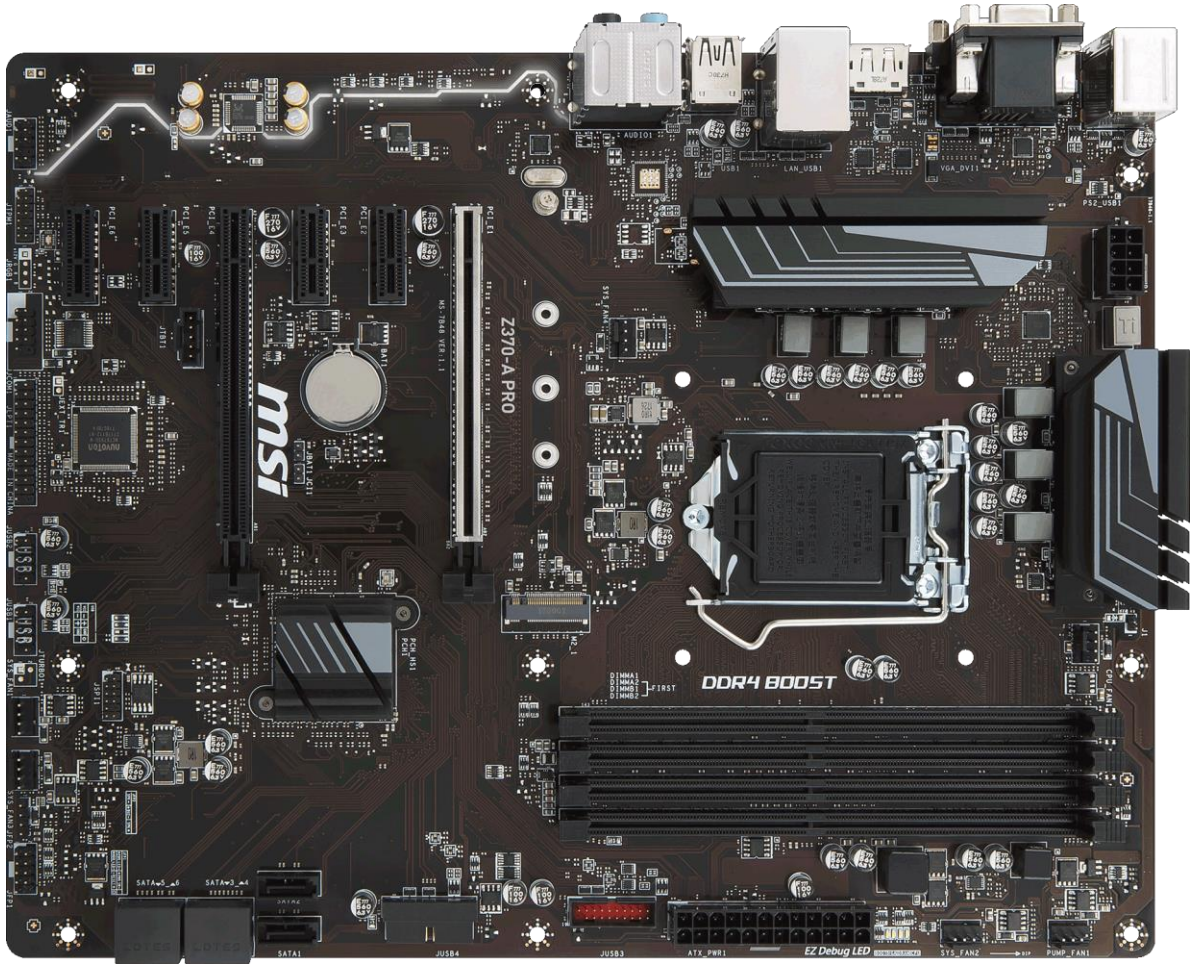
- The basic assembly of the computer consists of:
  - system (basic) unit,
  - input devices,
  - output devices.

The computer's system unit

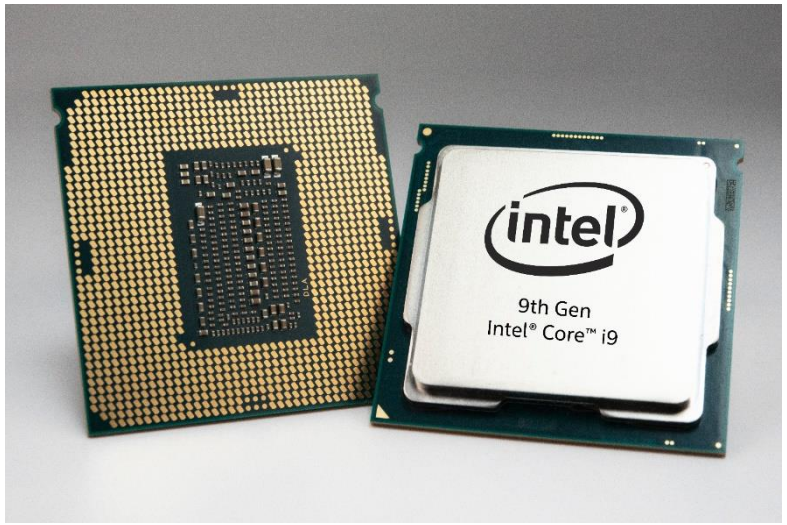
- **Motherboard**
  - Sound card
  - Graphic card (integrated)
  - Network card
  - Processor (CPU) – Intel, AMD, M (Apple)
  - Operating memory (RAM), ROM
- **Hard disk (HDD, SSD)**
- **Graphic card - external**
- **Source**

CHIPSET, SOCKET *(*bus connector*)*

BIOS *(Basic Input/Output System)*

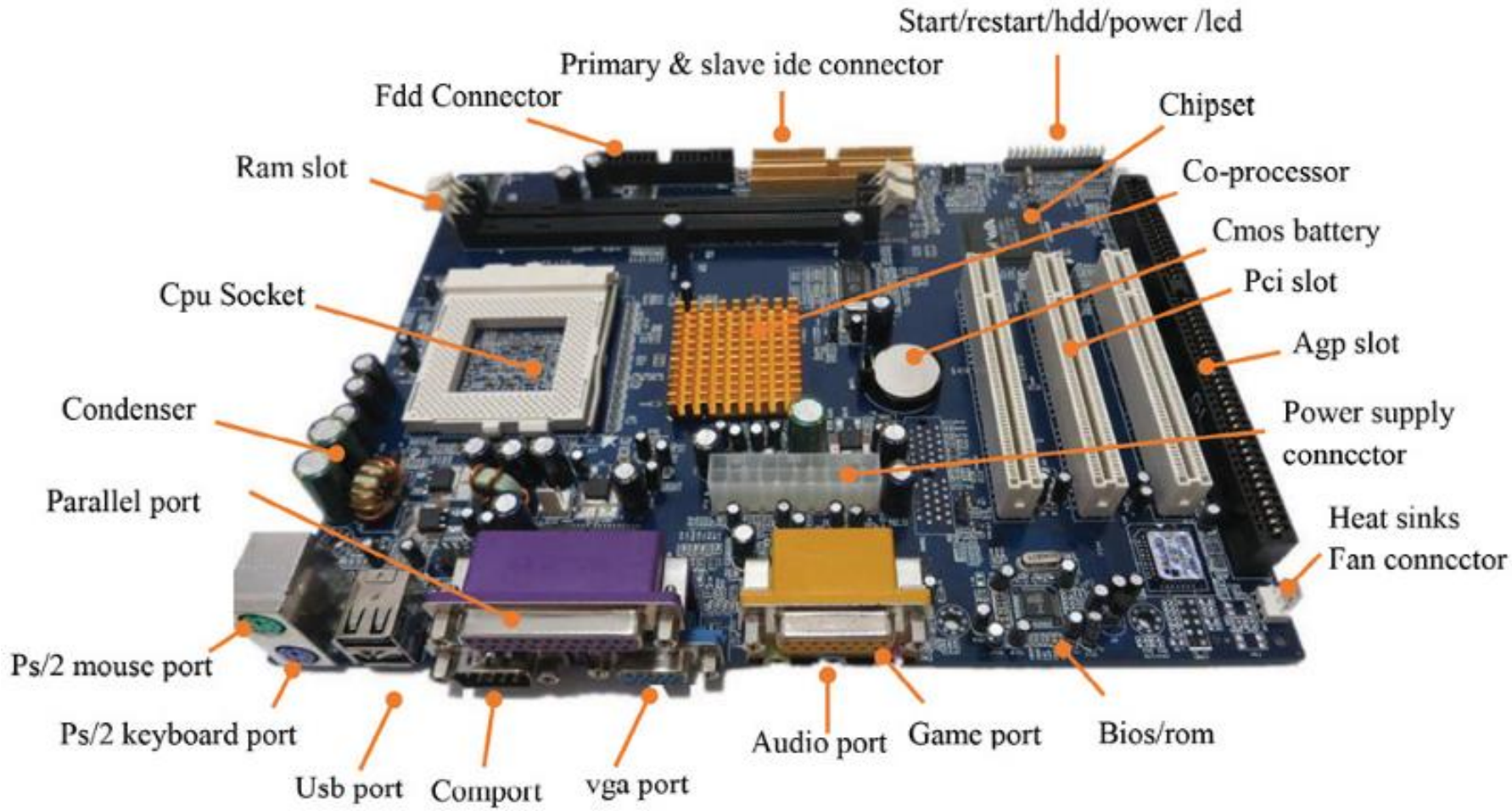


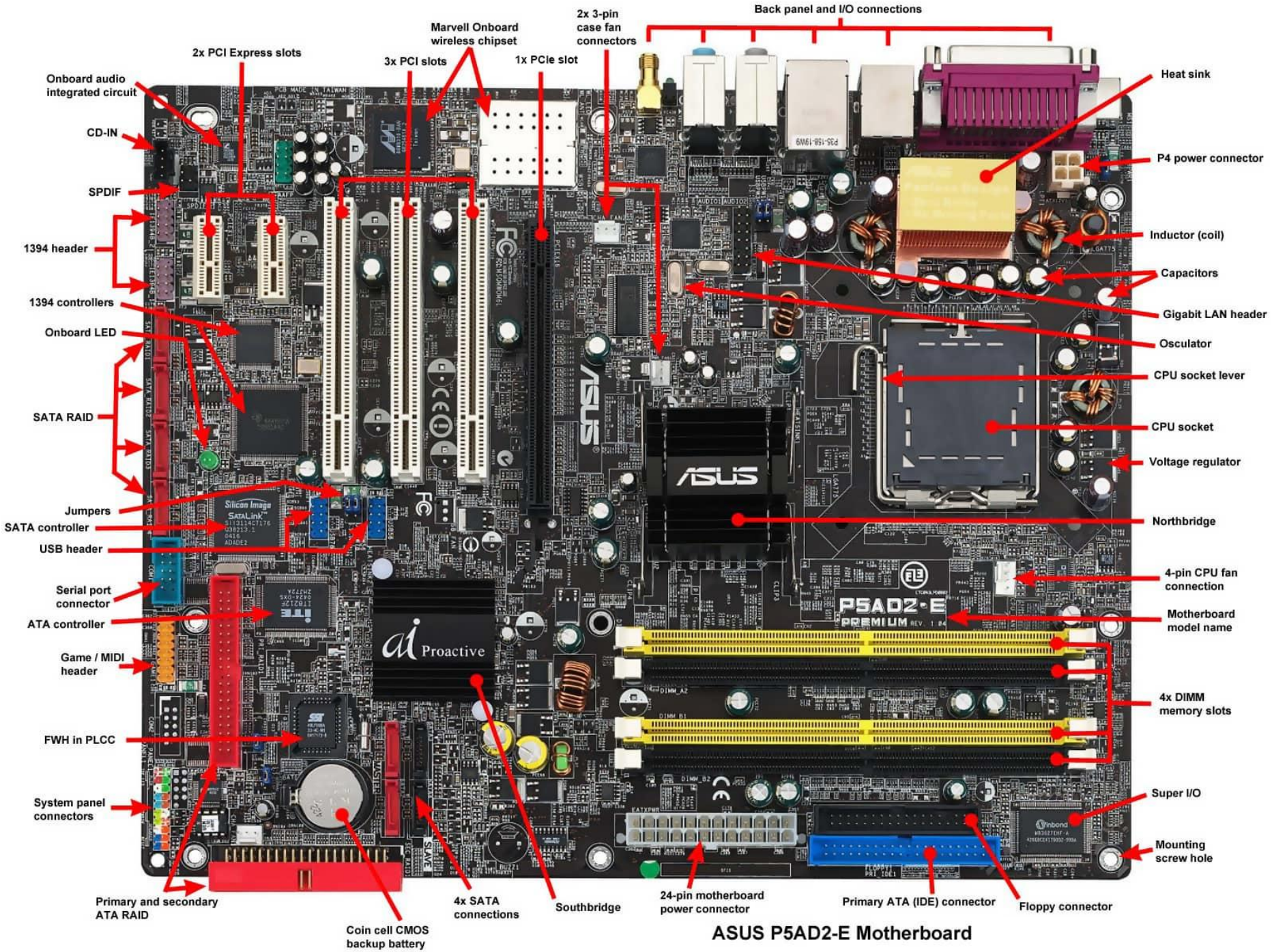
Processor



With or without integrated graphic chip, e. g. Intel Ultra HD Graphic 770

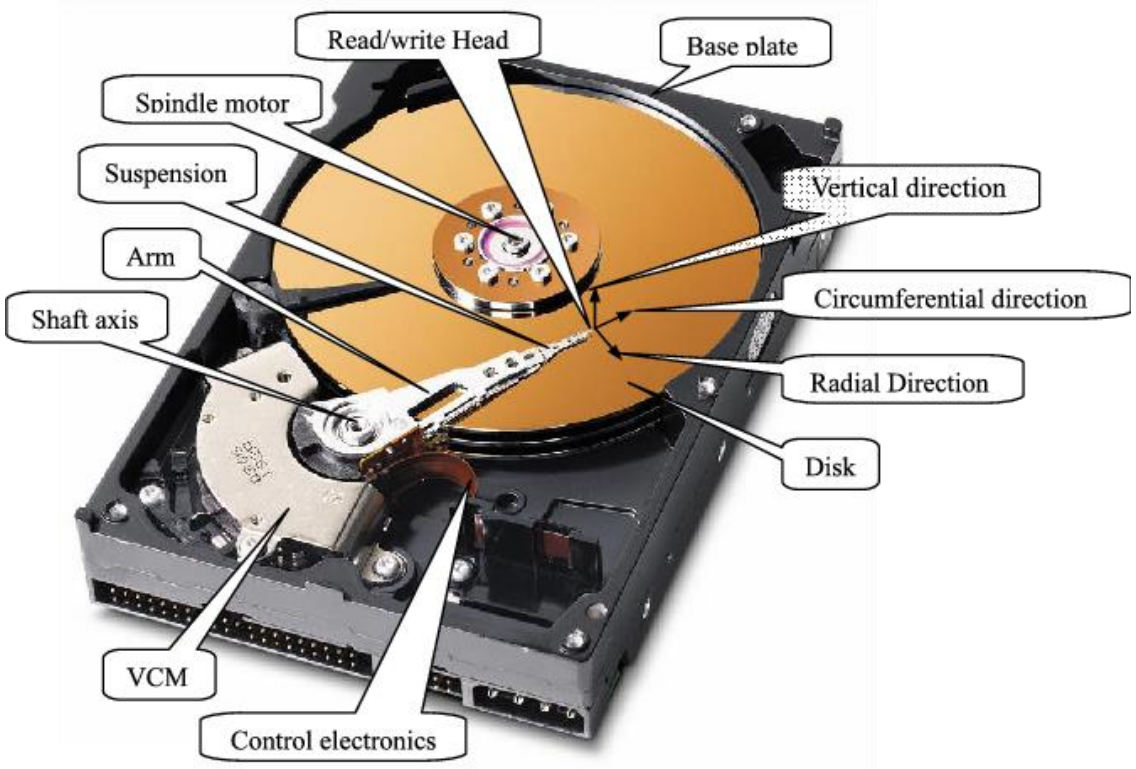
Motherboard





ASUS P5AD2-E Motherboard

HDD - Hard disk drive

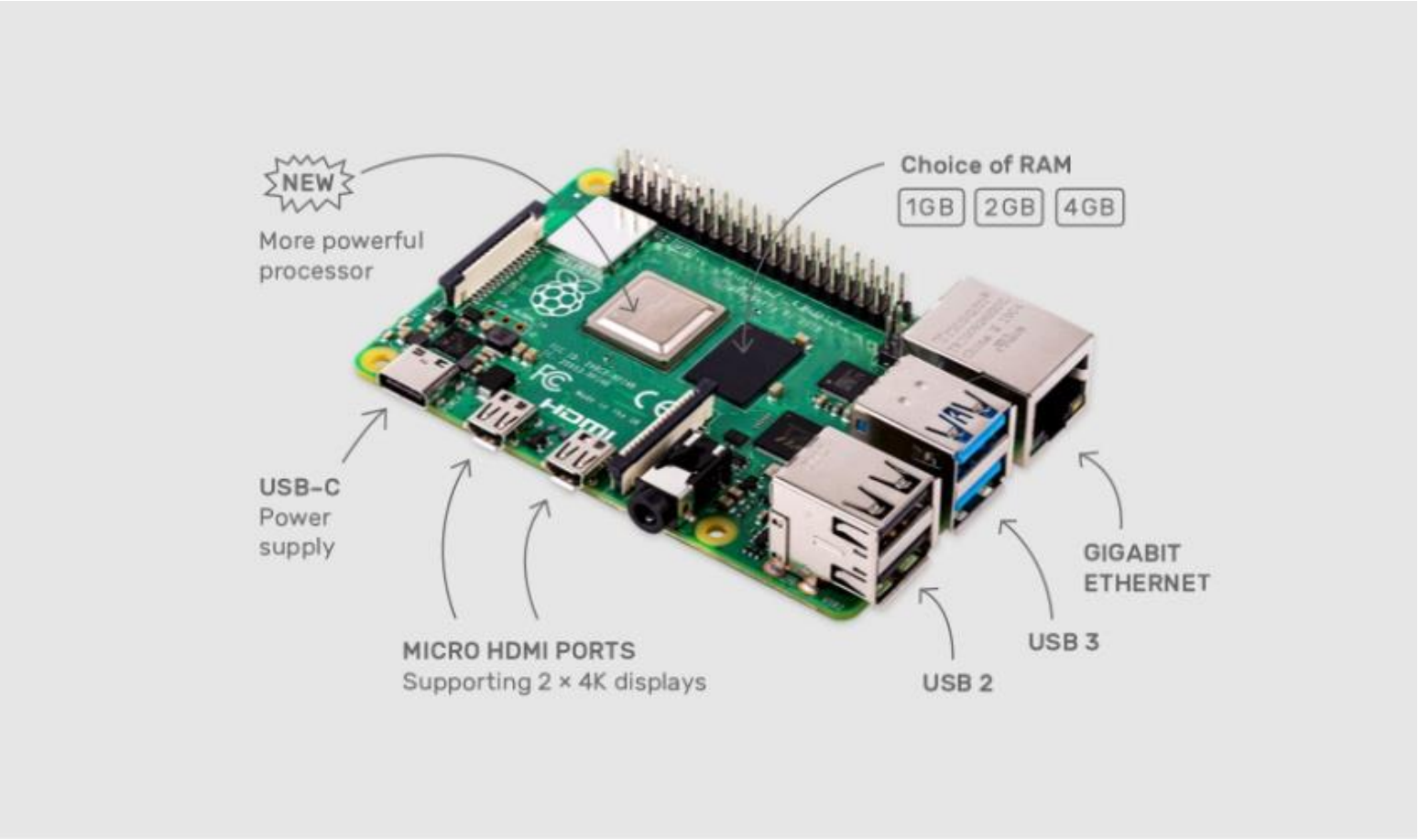


SSD – Solid State Drive

Graphic card - external

Graphics card is **a hardware which is used to increase the video memory of a computer and make its display quality more high-definition**. It makes the computer more powerful and gives it the capacity to do more high-level works. The quality of the image depends on the quality of the graphics card.

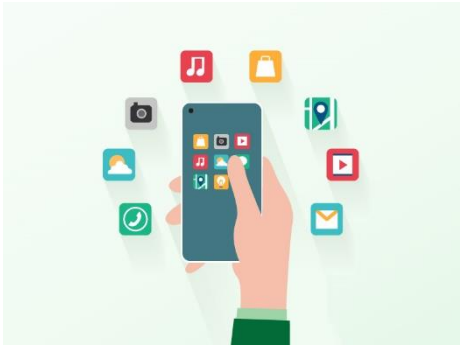
An example of a small computer - Raspberry Pi 4 model B



Input, output and combined input-output devices

Input-output devices

Input devices



Output devices

2. Software equipment of computers – Software

- **Basic software** – operating systems, their superstructures (updates), drivers

- **Applications supporting personal computing** – text editors (MS Word, Notepad), spreadsheet calculators (MS Excel), databases (MS Access), graphic editors, presentation programs (MS PowerPoint), etc.

- **Application software** – for specific tasks, e.g. accounting, production management, warehouse management, etc.

Operating system

- IS THE MOST IMPORTANT AND FUNDAMENTAL PROGRAM EQUIPMENT.

- controls the processing of all tasks on the computer, data management, oversees system security using the access rights system, ensures communication with connected additional devices

Every computer (desktop, personal, portable) must have an operating system because the operating system mediates communication between the user or between user programs and the computer.

Operating systems (OS)

Division by:

- number of users
  - single user OS
  - multi-user OS (so-called network OS)
- number of processed tasks
  - single program
  - multitasking (many programs running at the same time)
- type of processing
  - Multiprocessing – different processors for each program
  - Interprocessing – dynamic linking between applications
  - work in real time – minimum response time (e.g. air monitoring)

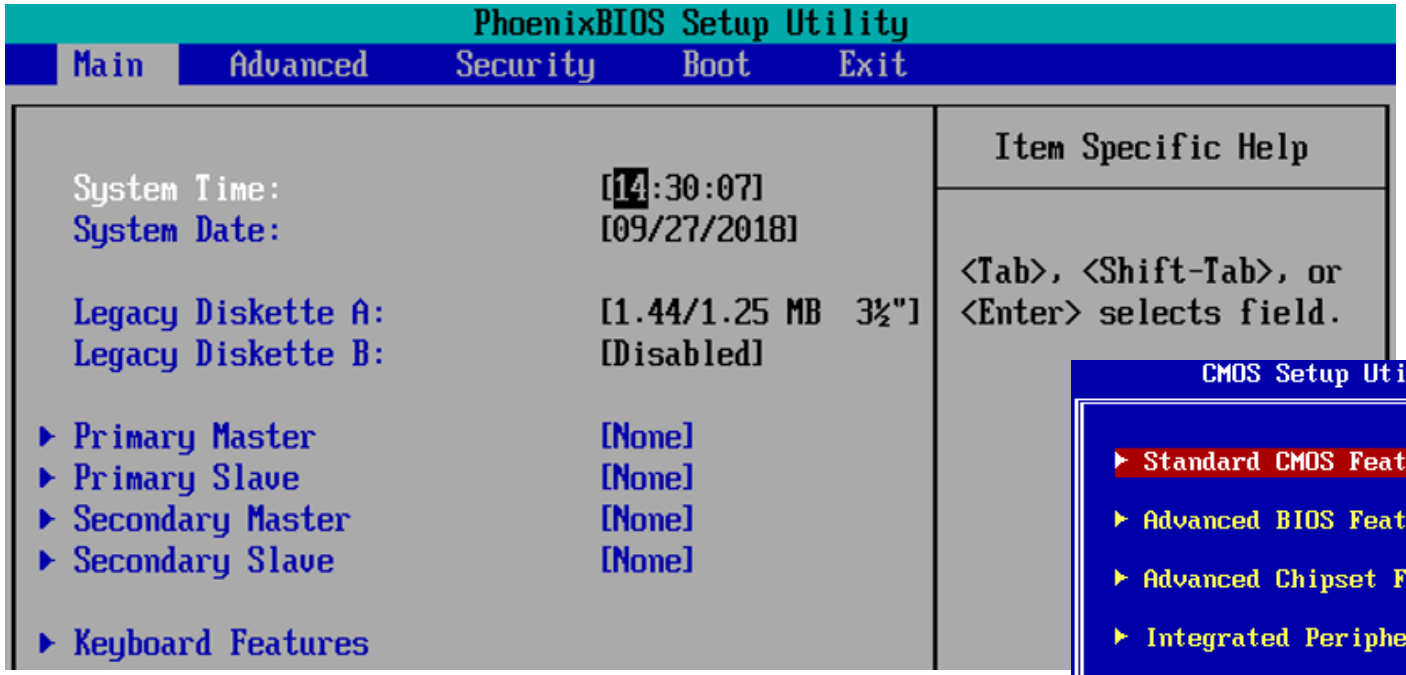
Operating systems (OS)

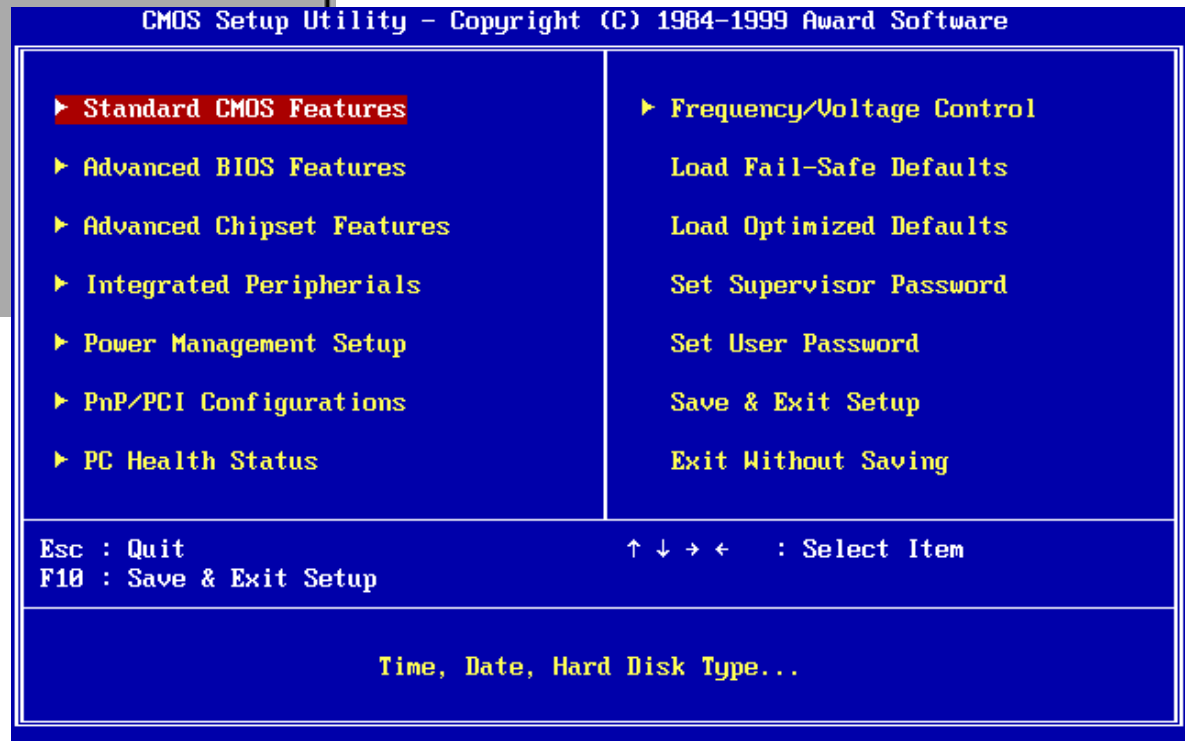
- For mobile phones, tablets, smart watches.
- For computers.

Examples of operating systems:

- MS Windows
- iOS, MAC OS
- Android
- Raspbian for Raspberry Pi

BIOS (Basic Input-Output System)





MS-DOS (8/1981)

The Microsoft Disk Operating System (MS-DOS) is **an operating system developed for PCs with x86 microprocessors (**x86-based personal computers mostly developed by Microsoft).

It is a command-line-based system, where all commands are entered in text form and there is no graphical user interface. MS-DOS was the most commonly used member of the family of disk operating systems.

It was the main operating system for IBM PC compatible personal computers during the 1980s to the mid-1990s.

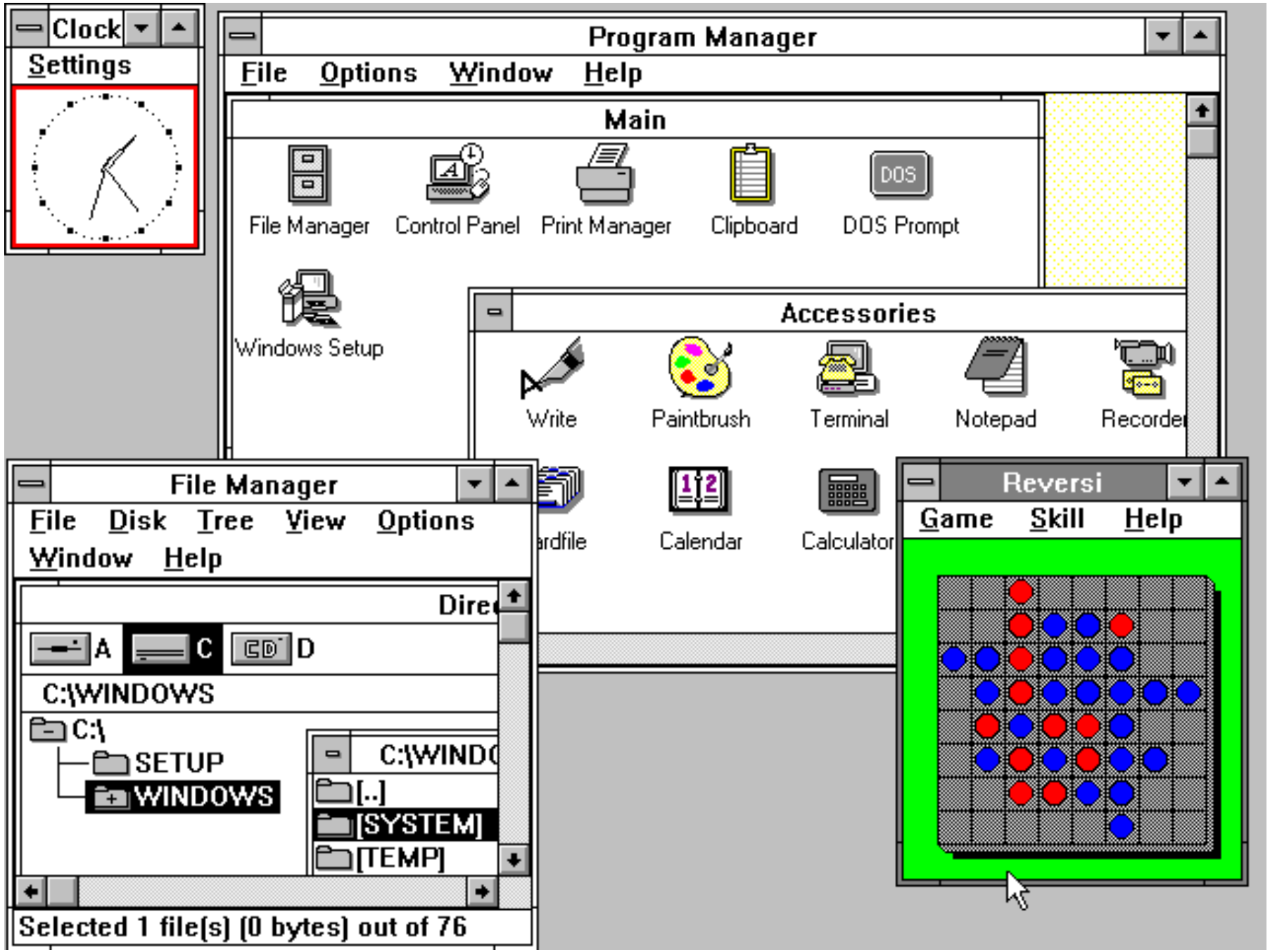
```
C:\>command


Microsoft(R) MS-DOS(R) Version 4.01
            (C)Copyright Microsoft Corp 1981-1988

C:\>ver

MS-DOS Version 4.01

C:\>dir command.com

 Volume in drive C is DOS
 Volume Serial Number is 2432-07DC
 Directory of  C:\

COMMAND  COM     37557 12-19-88  12:00a
        1 File(s)  495624192 bytes free

C:\>_
```

Windows 3 (1990)

Windows 3.0 is the third major release of Microsoft Windows, launched in 1990.

It features a new graphical user interface (GUI) where applications are represented as clickable icons, as opposed to the list of file names seen in its predecessors.

Later updates would expand the software's capabilities, one of which added multimedia support for sound recording and playback, as well as support for CD-ROMs.


Clock
Settings
Program Manager
File Options Window Help
Main
File Manager
Control Panel
Print Manager
Clipboard
DOS Prompt
Windows Setup
Accessories
Write
Paintbrush
Terminal
Notepad
Recorder
Calendar
Calculator
File Manager
File Disk Tree View Options
Window Help
A C D
C:\WINDOWS
C:\
SETUP
WINDOWS
[..]
[SYSTEM]
[TEMP]
Selected 1 file(s) (0 bytes) out of 76
Reversi
Game Skill Help

MS Windows 3.1 (4/1992)

- is a major release of Microsoft Windows. It was released to manufacturing on April 6, 1992, as a successor to Windows 3.0.

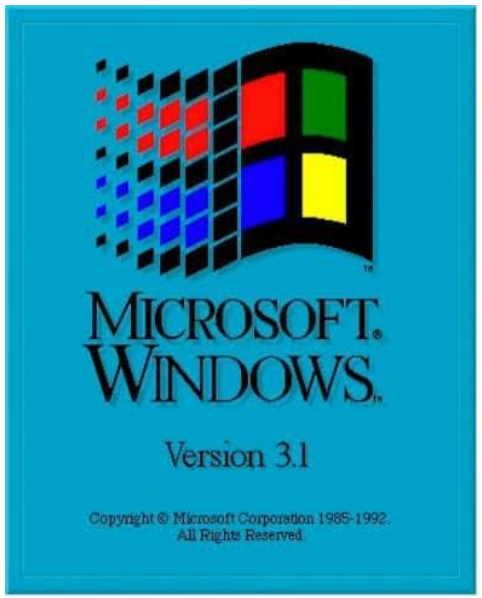
Like its predecessors, the Windows 3.1 series ran as a shell on top of MS-DOS. Codenamed Janus, Windows 3.1 introduced the TrueType font system as a competitor to Adobe Type Manager.

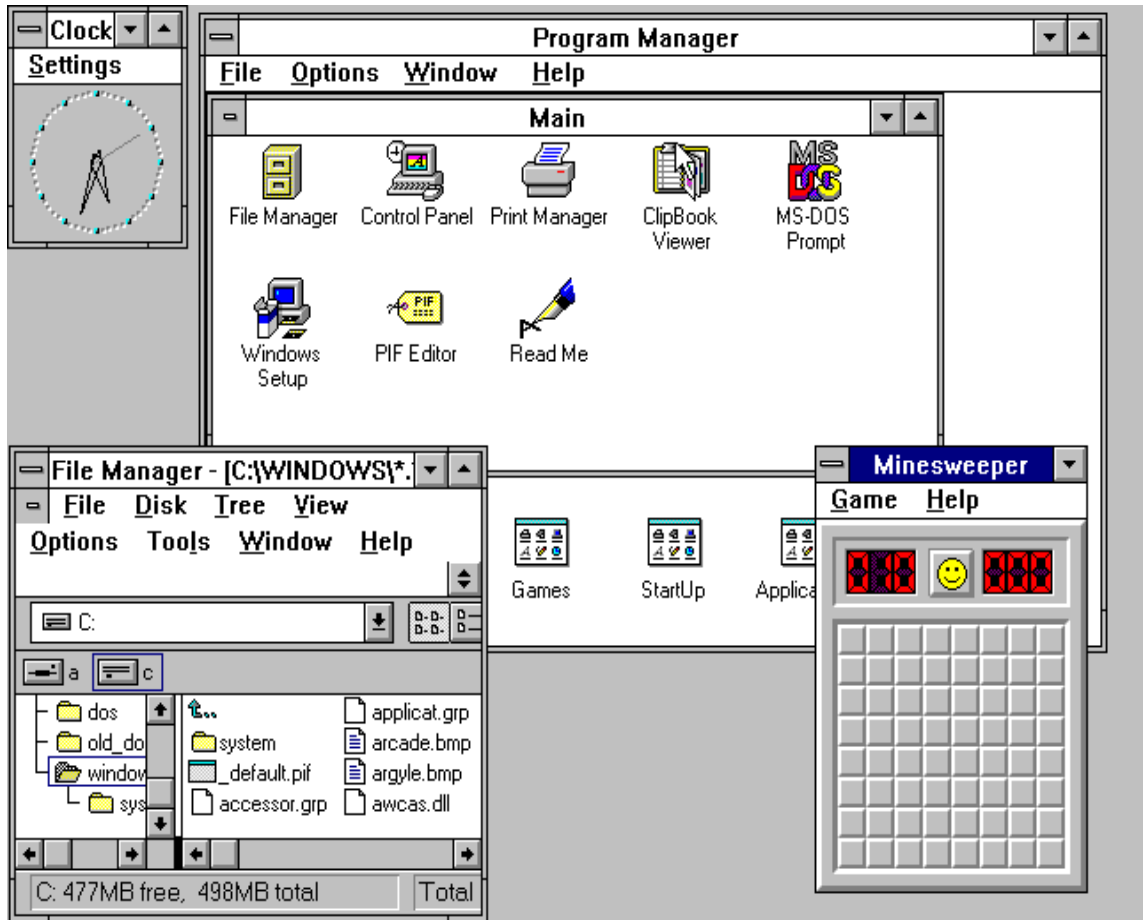
Its multimedia was also expanded, and screensavers were introduced, alongside new software such as Windows Media Player and Sound Recorder.

File Manager and Control Panel received tweaks, while Windows 3.1 also saw the introduction of Windows Registry and add-ons.

Windows 3.1 was the last Windows 16-bit operating environment, and it can run more RAM in comparison with its predecessors.

MS Windows 3.1 a 3.11





MS Windows 95 (8/1995)

Windows 95 is a consumer-oriented operating system developed by Microsoft as part of its Windows 9x family of operating systems.

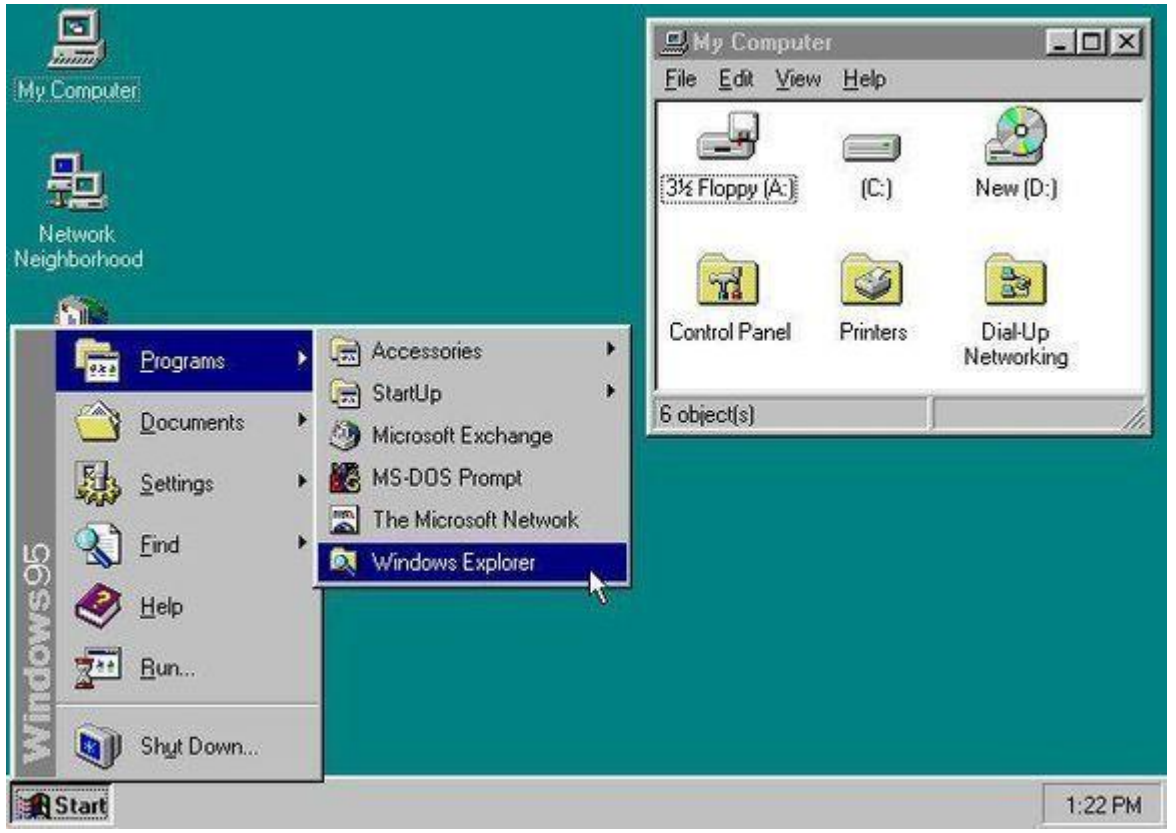
The first operating system in the 9x family, it is the successor to Windows 3.1x, and was released to manufacturing on July 14, 1995, and generally to retail on August 24, 1995.

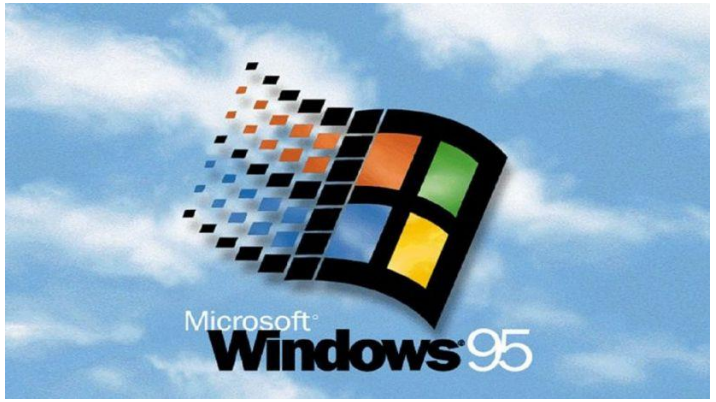
Windows 95 is the first version of Microsoft Windows to include the start button.

Windows 95 merged Microsoft's formerly separate MS-DOS and Microsoft Windows products, and featured significant improvements over its predecessor, most notably in the graphical user interface (GUI) and in its simplified "plug-and-play" features.

There were also major changes made to the core components of the operating system, such as moving from a mainly cooperatively multitasked 16-bit architecture to a 32-bit preemptive multitasking architecture, at least when running only 32-bit protected mode applications.

MS Windows 95

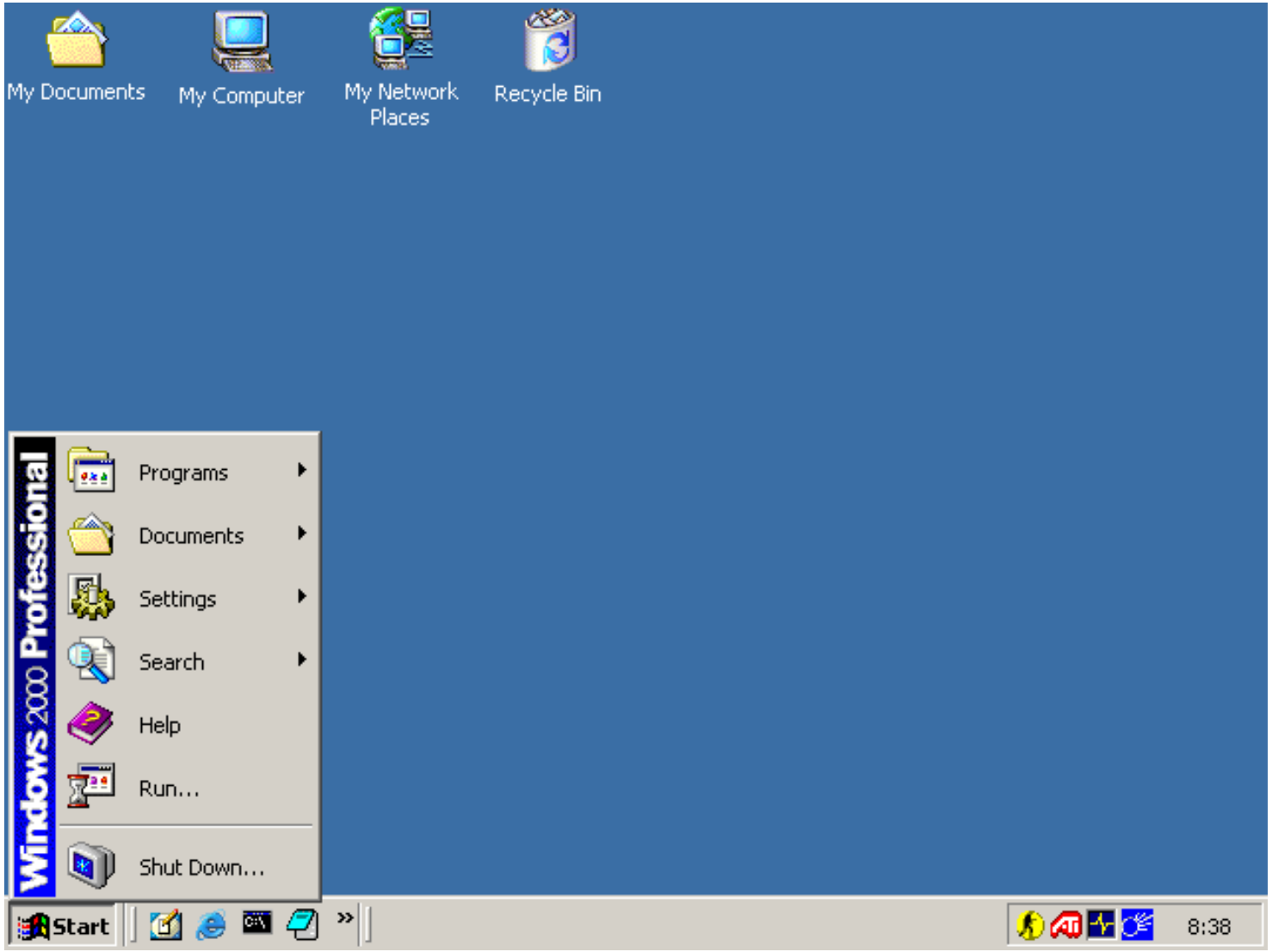




MS Windows 98 (6/1998)

- it is the successor to Windows 95
- like its predecessor, it is a hybrid 16-bit and 32-bit monolithic product with the boot stage based on MS-DOS.
- a web-integrated operating system that bears numerous similarities to its predecessor. Most of its improvements were cosmetic or designed to improve the user experience, but there were also a handful of features introduced to enhance system functionality and capabilities, including improved USB support and accessibility, as well as support for hardware advancements such as DVD players.
- it was the first edition of Windows to adopt the Windows Driver Model, and introduced features that would become standard in future generations of Windows, such as Disk Cleanup, Windows Update, multi-monitor support, and Internet Connection Sharing.

MS Windows 98



MS Windows 2000 (2/2000)

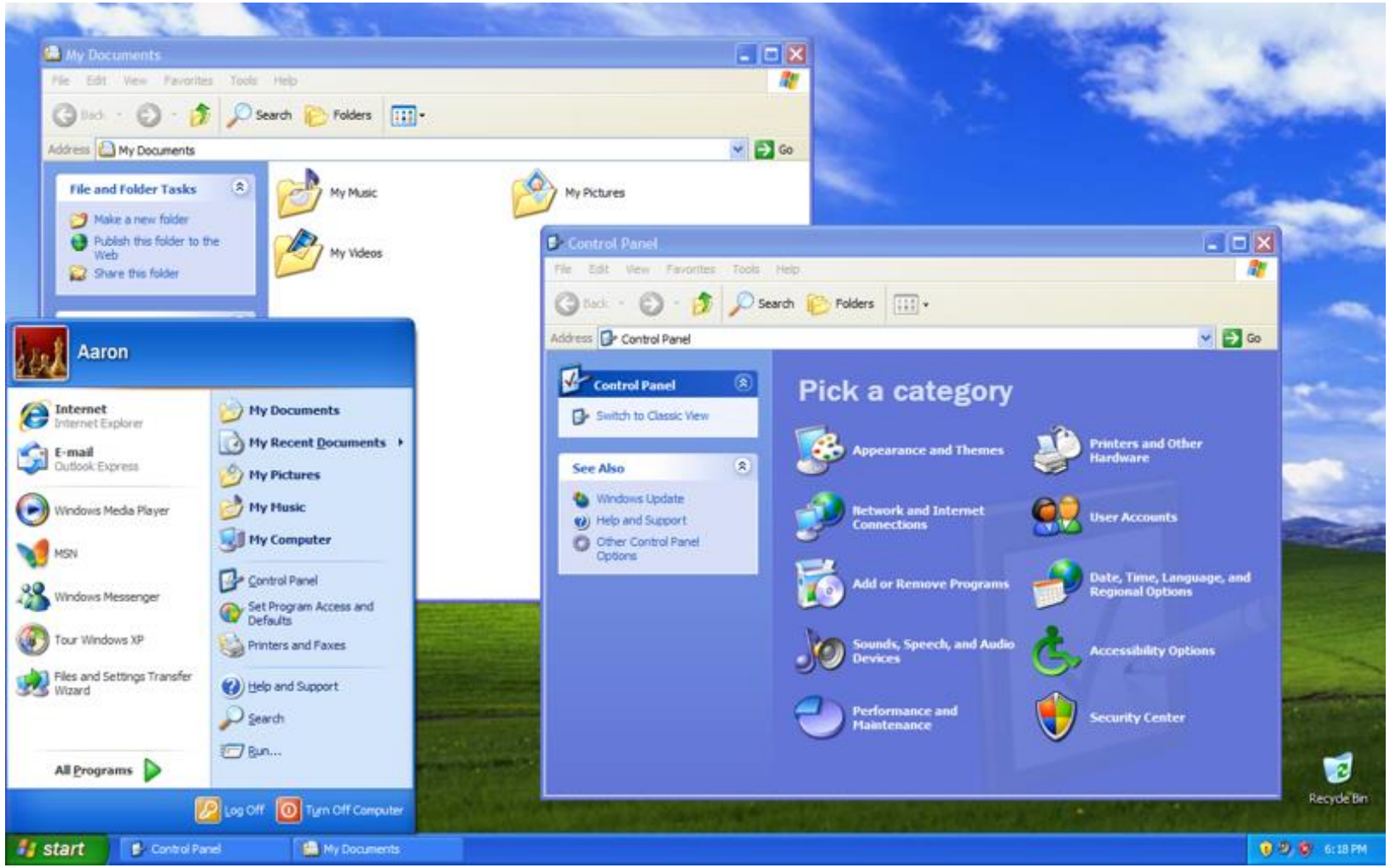
- it is a major release of the Windows NT operating system developed by Microsoft and designed for businesses. It was the direct successor to Windows NT 4.0.
- it was Microsoft's business operating system until the introduction of Windows XP Professional in 2001.
- Windows 2000 introduced NTFS 3.0, Encrypting File System, as well as basic and dynamic disk storage. Support for people with disabilities was improved over Windows NT 4.0 with a number of new assistive technologies, and Microsoft increased support for different languagesand locale information. The Windows 2000 Server family has additional features, most notably the introduction of Active Directory, which in the years following became a widely used directory service in business environments.

Microsoft Windows 2000

MS Windows XP (8/2001)

- it is a major release of Microsoft's Windows NT operating system;
- t is a direct upgrade to its predecessors, Windows 2000 for high-end and business users and Windows Me for home users, and is available for any devices running Windows NT 4.0, Windows 98, Windows 2000, or Windows Me that meet the new Windows XP system requirements;
- Upon its release, Windows XP received critical acclaim, noting increased performance and stability (especially compared to Windows Me), a more intuitive user interface, improved hardware support, and expanded multimedia capabilities;
- Windows XP and Windows Server 2003 were succeeded by Windows Vista and Windows Server 2008, released in 2007 and 2008, respectively. However, some criticisms of Windows XP were its security issues at launch, and many people believed their anti-piracy schemes had gone too far.

MS Windows XP (8/2001)



Service Pack 1, 2 a 3

MS Windows Vista (1/2007)

- it is a major release of Microsoft's Windows NT operating system;
- available on January 30, 2007;
- the first release of Windows to be made available through a digital distribution platform. Vista succeeded Windows XP (2001); at the time, the five-year gap between the two was the longest time span between successive Windows releases;
- while its new features and security improvements garnered praise, Vista was the target of significant criticism, such as its high system requirements, more restrictive licensing terms, lack of compatibility, longer boot time, and excessive authorization prompts from User Account Control;
- it saw lower adoption and satisfaction rates than XP, and it is generally considered a market failure.

MS Windows Vista (1/2007)

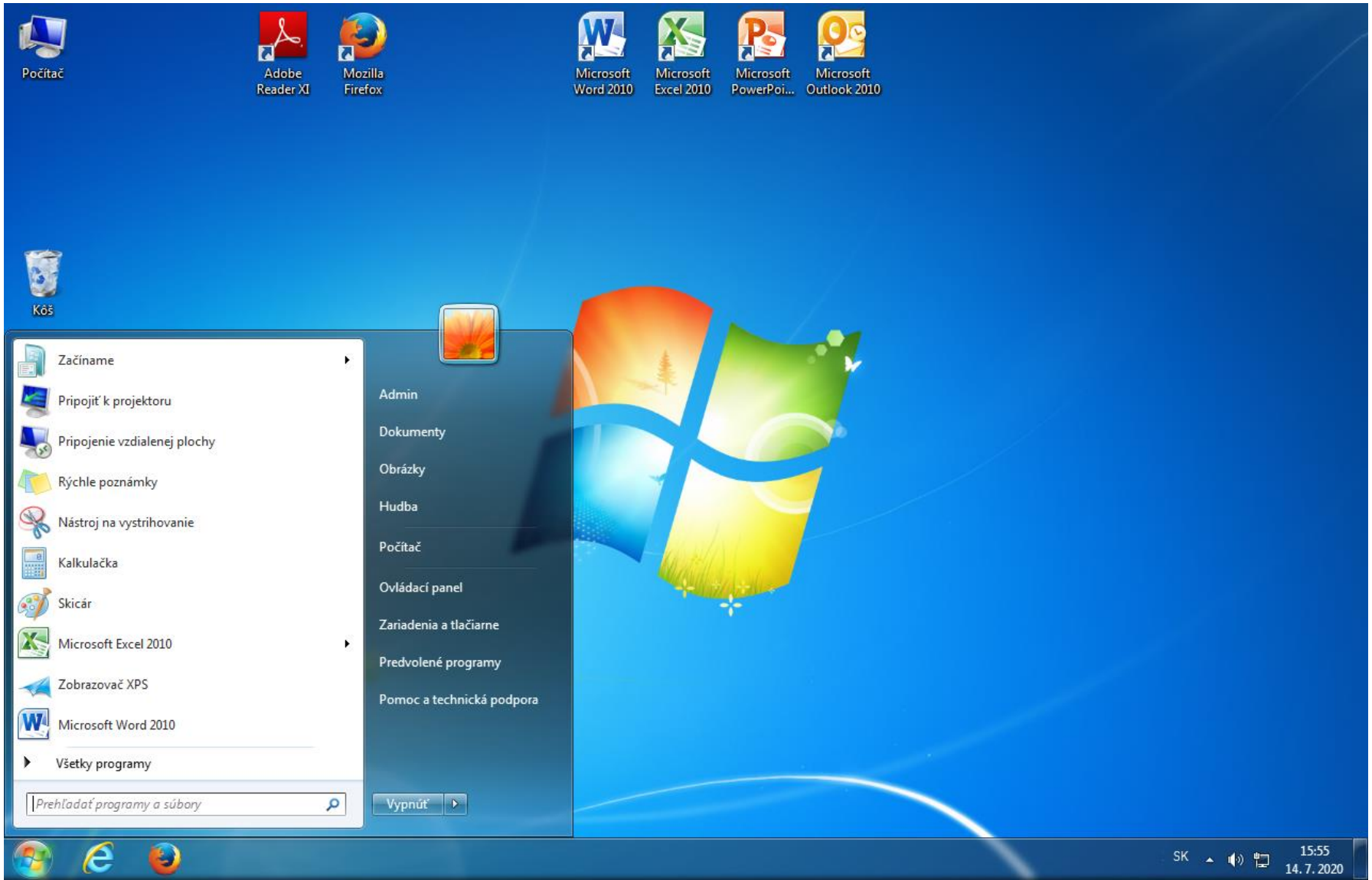
MS Windows 7 (10/2009)

- It is the successor to Windows Vista available on October 22, 2009;
- Windows 7 remained an operating system for use on personal computers, including home and business desktops, laptops, tablet PCs and media center PCs, and itself was replaced in November 2012 by Windows 8, the name spanning more than three years of the product;
- it was intended to be an incremental upgrade to Microsoft Windows, addressing Windows Vista's poor critical reception while maintaining hardware and software compatibility;
- continued improvements on the Windows Aero user interface with the addition of a redesigned taskbar that allows pinned applications, and new window management features. Other new features were added to the operating system, including **libraries**, the new **file-sharing** system **HomeGroup**, and support for **multitouch** input. A new **"Action Center"** was also added to provide an overview of system security and maintenance information, and tweaks were made to the User Account Control system to make it less intrusive. U
- updated versions of several stock applications, including Internet **Explorer 8**, **Windows Media Player**, and **Windows Media Center**.

MS Windows 7 (10/2009)

- unlike Windows Vista, Windows 7 received critical acclaim, with critics considering the operating system to be a major improvement over its predecessor because of its improved performance, its more intuitive interface, fewer User Account Control popups, and other improvements made across the platform.
- it was was a major success for Microsoft; even before its official release - pre-order sales.

MS Windows 7 (10/2009)



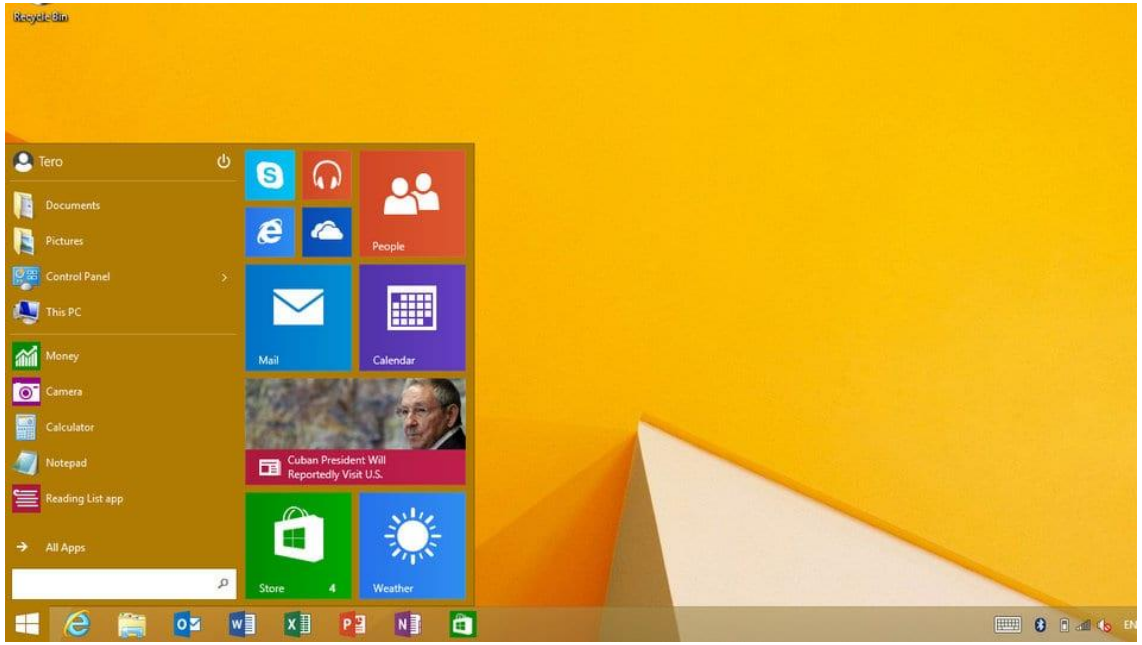
MS Windows 8 (8/2012)

- W8 introduced major changes to the operating system's platform and user interface with the intention to improve its user experience on tablets, where Windows competed with mobile operating systems such as Android and iOS;
- In particular, these changes included a **touch-optimized Windows shell** and **start screen** based on **Microsoft's Metro design language**, integration with online services, the Windows Store, and a new keyboard shortcut for screenshots;
- Many of these features were adapted from Windows Phone. Windows 8 also added support for **USB 3.0**, **Advanced Format**, **near-field communication**, and **cloud computing**. Additional security features – including **built-in antivirus software**, integration with **Microsoft SmartScreen phishing filtering**, and support for **Secure Boot** on supported devices – were introduced.

MS Windows 8 (8/2012)

- W8 received a mostly negative reception. Although the reaction to its performance improvements, security enhancements, and improved support for touchscreen devices was positive, the new user interface of the operating system was widely criticized for being confusing and unintuitive, especially when used with a keyboard and mouse instead of a touchscreen;
- Microsoft released Windows 8.1 in October 2013, which addressed some aspects of Windows 8 that were criticized by reviewers and early adopters and also incorporated improvements to various aspects of the operating system.

MS Windows 8 (8/2012)



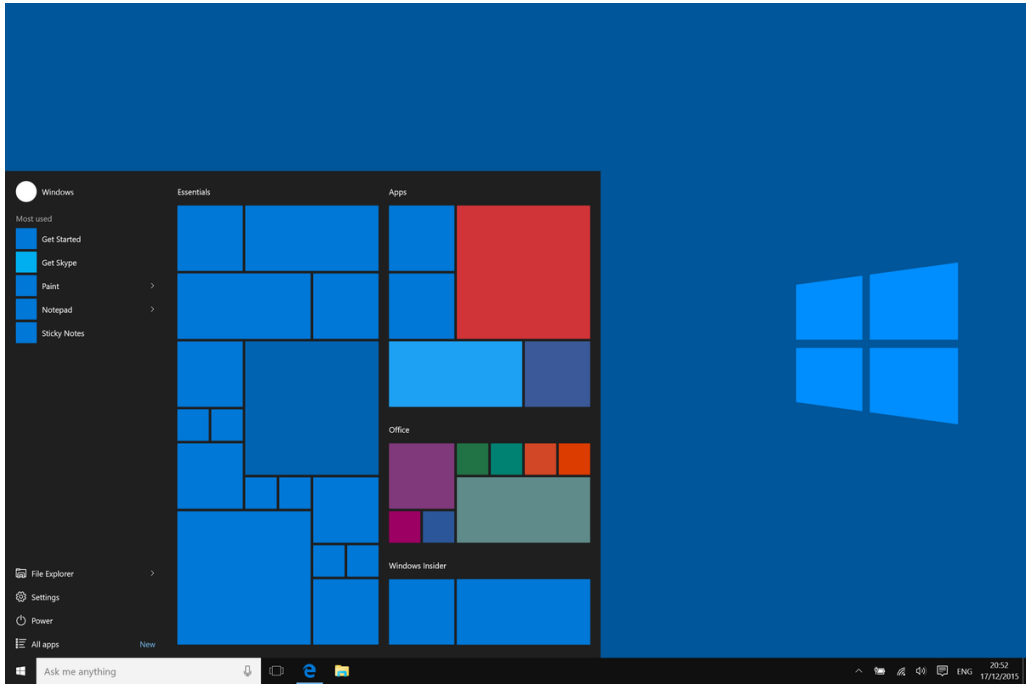
MS Windows 10 (7/2015)

- it is the direct successor to Windows 8.1;
- W10 was made available for download via MSDN and TechNet, as a free upgrade for retail copies of Windows 8 and Windows 8.1 users via the Windows Store, and to Windows 7 users via Windows Update;
- W10 receives new builds on an ongoing basis, which are available at no additional cost to users, in addition to additional test builds of Windows 10, which are available to Windows Insiders. Devices in enterprise environments can receive these updates at a slower pace or use long-term support milestones that only receive critical updates, such as security patches, over their ten-year lifespan of extended support.

MS Windows 10 (7/2015)

- W10 received generally positive reviews upon its original release. Critics praised Microsoft's decision to provide the desktop-oriented interface in line with previous versions of Windows, contrasting the tablet-oriented approach of Windows 8, although Windows 10's touch-oriented user interface mode was criticized for containing regressions upon the touch-oriented interface of its predecessor;
- support for Windows 10 will end on October 14, 2025.

MS Windows 10



MS Windows 11 (10/2021)

- it was a free upgrade to its predecessor, Windows 10 (2015), and is available for any Windows 10 devices that meet the new Windows 11 system requirements but can also be installed on unsupported devices by bypassing the restrictions of system requirements;
- it features major changes to the Windows shell influenced by the canceled Windows 10X, including a redesigned Start menu, the replacement of its "live tiles" with a separate "**Widgets**" panel on the taskbar, the ability to create tiled sets of windows that can be minimized and restored from the taskbar as a group, and new gaming technologies inherited from Xbox Series X and Series S such as Auto HDR and DirectStorage on compatible hardware;
- Internet Explorer has been replaced by Microsoft Edge;
- Microsoft Teams is integrated in the operating system.

MS Windows 11 (10/2021)

Mac OS (2001)

- macOS (previously OS X and originally Mac OS X) is an operating system developed and marketed by Apple Inc. since 2001. It is the primary operating system for Apple's Mac computers. Within the market of desktop and laptop computers, it is the second most widely used desktop OS, after Microsoft Windows and ahead of Linux (including ChromeOS);
- it succeeded the classic Mac OS, a Macintosh operating system from 1984 to 2001. During this time, Apple co-founder Steve Jobs had left Apple and started another company, NeXT, developing the NeXTSTEP platform that would later be acquired by Apple to form the basis of macOS;

Mac OS (2001)

- A prominent part of macOS's original brand identity was the use of Roman numeral X, pronounced "ten" as in Mac OS X and also the iPhone X, as well as code naming each release after species of big cats, or places within California;
- Apple's other operating systems (**iOS, iPadOS, watchOS, tvOS, audioOS**) are derivatives of macOS;
- as of 2023, the most recent release of macOS is macOS 14 **Sonoma**.

Mac OS and iOS

Android (11/2007)

- it is a mobile operating system based on a modified version of the Linux kernel and other open-source software, designed primarily for touchscreen mobile devices such as smartphones and tablets;
- it is developed by a consortium of developers known as the Open Handset Alliance, though its most widely used version is primarily developed by Google. It was unveiled in November 2007, with the first commercial Android device, the HTC Dream, being launched in September 2008.

Android (11/2007)

- At its core, the operating system is known as **Android Open Source Project** (AOSP) and is free and open-source software (FOSS) primarily licensed under the Apache License. However most devices run on the proprietary Android version developed by Google, which ship with additional proprietary closed-source software pre-installed, most notably Google Mobile Services (GMS) which includes core apps such as **Google Chrome**, the digital distribution platform **Google Play**, and the associated **Google Play Services** development platform;
- While AOSP is free, the "Android" name and logo are trademarks of Google, which imposes standards to restrict the use of Android branding by "uncertified" devices outside their ecosystem.

Android (11/2007)

- The source code has been used to develop variants of Android on a range of other electronics, such as game consoles, digital cameras, portable media players, and PCs, each with a specialized user interface. Some well-known derivatives include Android TV for televisions and Wear OS for wearables, both developed by Google;
- From version 2.3 (**Gingerbread – 9the feb. 2019)** to version 9 (**Pie – 6th autust 2018)**) all version had the name of a cookie. From version 10 only version numbers are shown.


ALPHA
2008
BETA
2009
CUPCAKE
2009
DONUT
2009
ECLAIR
2009
FROYO
2010
GINGERBREAD
2010
HONEYCOMB
2011
ICE CREAM SANDWICH
2011
JELLYBEAN
2012
KITKAT
2013
LOLLIPOP
2014
MARSHMALLOW
2015
NOUGHAT
2016
OREO
2017
ANDROID

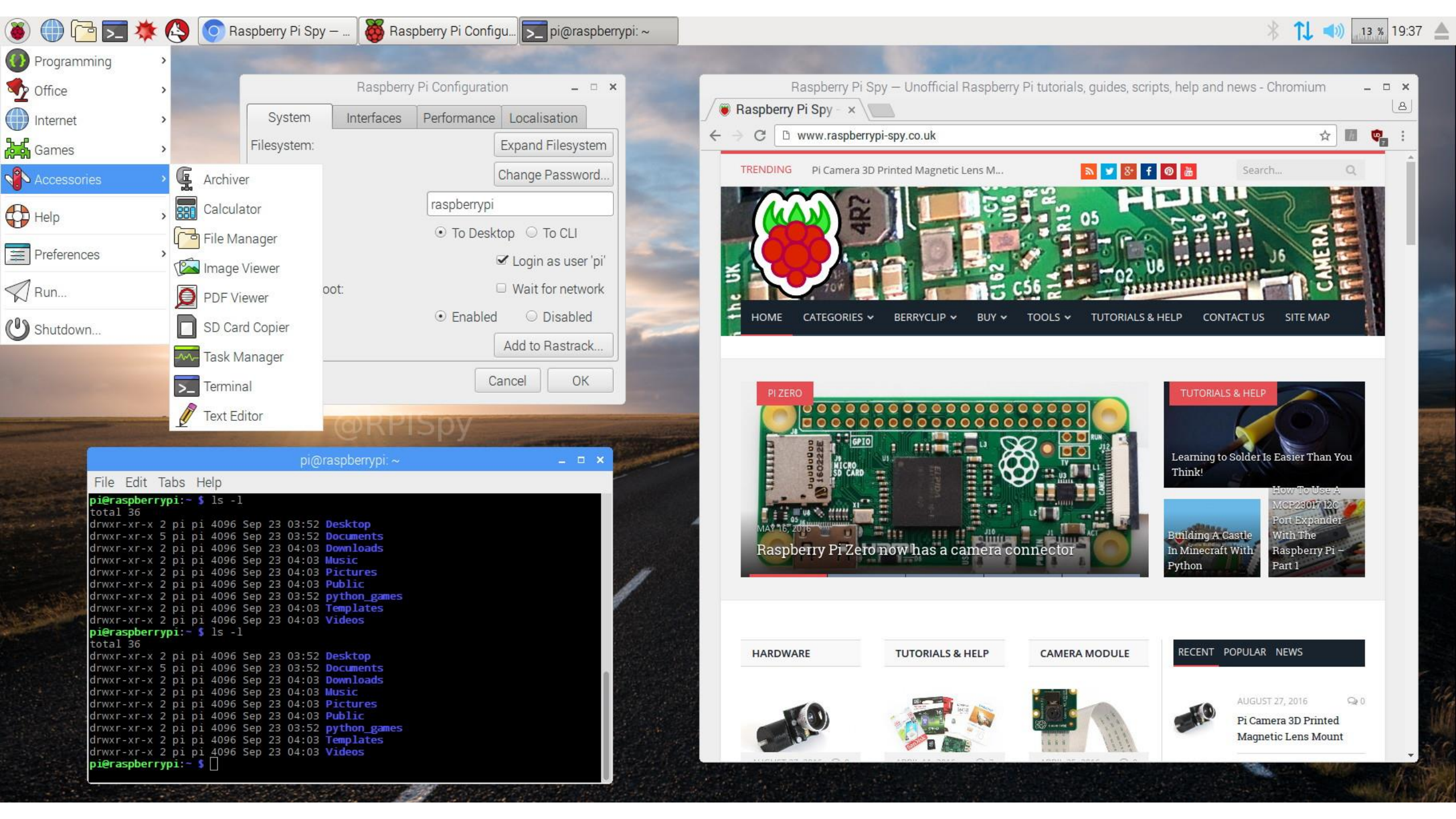
Android


10:10
Say "Ok Google"
08:08
Paris
12°C
8 / 18
Tuesday, March 27
Phone Man..
Themes
Music
Videos
Health
Google
Play Store
Email
Settings
Gallery
Dialer
Contacts
Messages
Chrome
Camera


android

Raspbian (2013)

- Raspberry Pi OS (formerly Raspbian) is a Unix-like operating system based on the Debian Linux distribution for the Raspberry Pi family of compact single-board computers. First developed independently in 2012, it has been produced as the primary operating system for these boards since 2013, distributed by the Raspberry Pi Foundation;
- it is highly optimized for the Raspberry Pi with ARM CPUs. It runs on every Raspberry Pi except the Pico microcontroller. Raspberry Pi OS uses a modified LXDE desktop environment with the Openbox stacking window manager, along with a unique theme. The default distribution is shipped with a copy of the computer algebra system Wolfram Mathematica, VLC, and a lightweight version of the Chromium web browser.


Raspberry Pi Spy — ...
Raspberry Pi Configu...
pi@raspberrypi: ~
13 %
19:37
Programming
Office
Internet
Games
Accessories
Help
Preferences
Run...
Shutdown...
Archiver
Calculator
File Manager
Image Viewer
PDF Viewer
SD Card Copier
Task Manager
Terminal
Text Editor
Raspberry Pi Configuration
System
Interfaces
Performance
Localisation
Filesystem:
Expand Filesystem
Change Password...
raspberrypi
To Desktop
To CLI
Login as user 'pi'
Wait for network
Enabled
Disabled
Add to Rastrack...
Cancel
OK
@RPiSpy
pi@raspberrypi: ~
File Edit Tabs Help
pi@raspberrypi:~ $ ls -l
total 36
drwxr-xr-x 2 pi pi 4096 Sep 23 03:52 Desktop
drwxr-xr-x 5 pi pi 4096 Sep 23 03:52 Documents
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Downloads
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Music
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Pictures
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Public
drwxr-xr-x 2 pi pi 4096 Sep 23 03:52 python_games
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Templates
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Videos
pi@raspberrypi:~ $ ls -l
total 36
drwxr-xr-x 2 pi pi 4096 Sep 23 03:52 Desktop
drwxr-xr-x 5 pi pi 4096 Sep 23 03:52 Documents
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Downloads
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Music
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Pictures
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Public
drwxr-xr-x 2 pi pi 4096 Sep 23 03:52 python_games
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Templates
drwxr-xr-x 2 pi pi 4096 Sep 23 04:03 Videos
pi@raspberrypi:~ $
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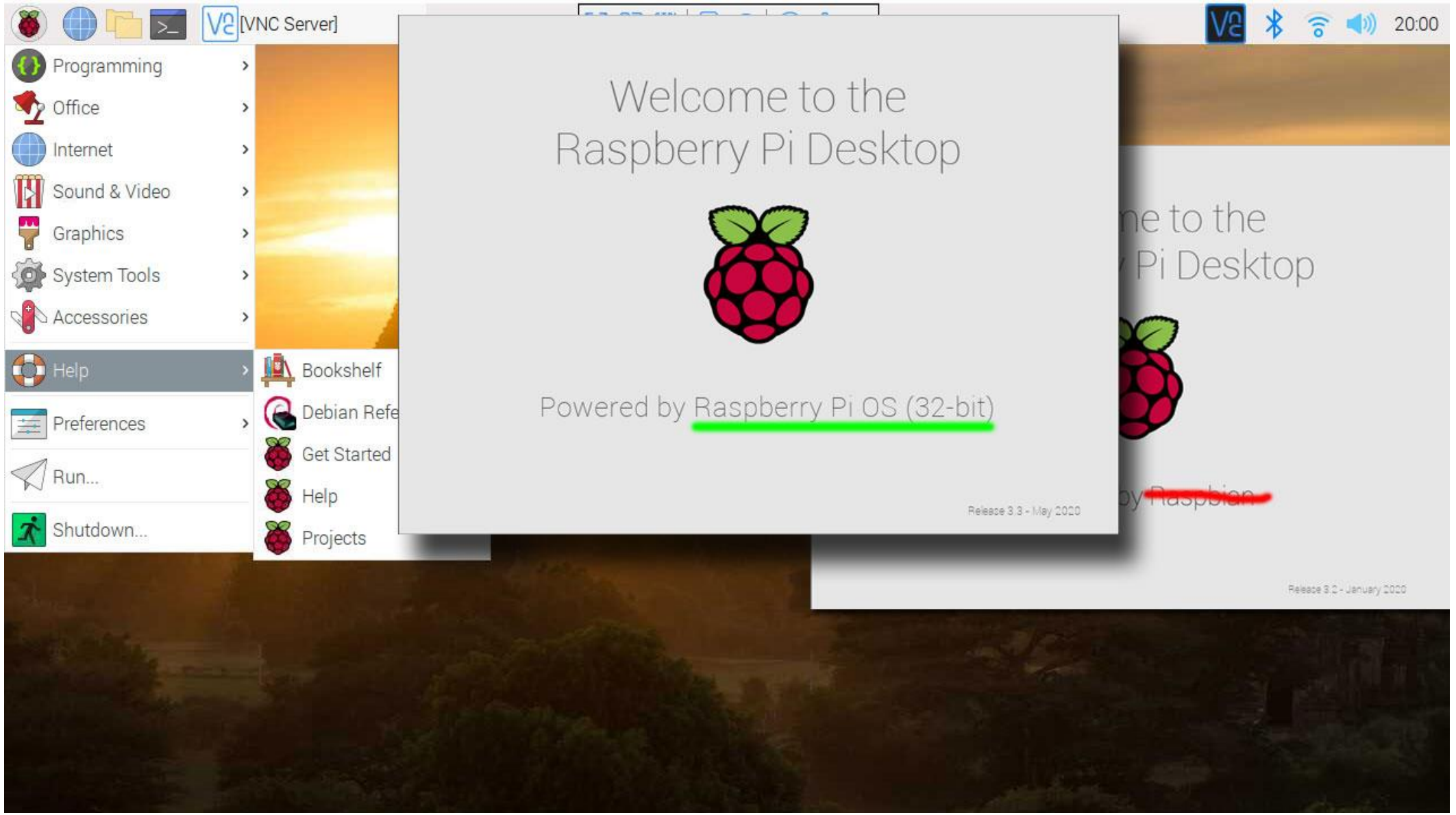
[VNC Server]
20:00
Programming
Office
Internet
Sound & Video
Graphics
System Tools
Accessories
Help
Preferences
Run...
Shutdown...
Bookshelf
Debian Refe
Get Started
Help
Projects
Welcome to the
Raspberry Pi Desktop
Powered by Raspberry Pi OS (32-bit)
Release 3.3 - May 2020
Release 3.2 - January 2020

3. Security aspects of information processing

Two sides **– computer infiltrations** and **computer security**

Computer infiltrations - are any unauthorized access to the computer.

MALWARE – ***MAL***icious soft***WARE*** (marking malicious code)

- they represent a phenomenon,
- they divide people into two groups,
- they are an integral part of cyberspace,
- they develop dynamically,
- they focus on the most used systems.

3. Security aspects of information processing

Malware *is any software intentionally designed to cause disruption to a* ***computer, server, client,*** *or* ***computer network, leak private information, gain unauthorized access to information or systems, deprive access to information,*** *or* ***which unknowingly interferes with the user's computer security and privacy.***

Computer infiltrations - malware

☹ **viruses**,

☹ **worms** (octopus, rabbits),

☹ **trojan horses**,

☹ **logical bombs**,

☹ **exploits**,

☹ **downloaders**,

☹ **backdoor**,

☹ **spyware**,

☹ **hoax**,

☹ **flooders**,

☹ **keyloggers**,

☹ **rootkits**,

☹ **phising**,

☹ **ransomware** (malware for blackmailing).

Computer security

Antivirus programs, or security solution

- they are programs that are used for localization, subsequent removal of infiltration and maximum repair of the damage caused.

Types of antivirus programs:

- **single-purpose programs** – directed against a specific infiltration or group
- **software packages** – complete summaries of antivirus programs (antivirus, firewall, antispam, antiadware, ...)
  (NOD, AVG, AVAST“, F-Secure, McAfee, ...)

Apple computerts – rewrite the whole operating system – this deletes all malware.

Computer security in Windows OS

- Privacy – security of personal data
- network firewall
- windows update
- backup and restore
- Malicious Software Removal Tool

Policies, advice and instructions that are important for the protection and security of your computer, data and for the safe use of e-mail and the web:

- do not open e-mails from an unknown sender and do not open unsolicited attachments in e-mails at all,
- use strong passwords. No one has the right to know your password,
- not to publish your personal data on the website,
- pay attention to physical security,
- do not respond to unsolicited advertising in the form of e-mail,
- surf the web carefully,
- when browsing the Internet, do not blindly confirm all reports about the necessary installation of various utilities and add-ons,
- install only add-ons from websites that the user trusts,
- do not click on suspicious links that promise instant winnings or unlimited access to adult sites,
- use only commercial and somehow verified software,
- shop only in good and verified online stores,
- back up data regularly and perform recovery.

Safe use of public computers (on vacation)

Follow these tips:

- ✓ do not save your login data,
- ✓ do not leave the computer unattended when sensitive data is displayed on the screen,
- ✓ delete records of your activity,
- ✓ pay attention to people who move around you,
- ✓ not to enter sensitive information into a public computer,
- ✓ do not use internet banking.

Legal aspects of PC use

Legal aspects concern every computer user who uses various software in their work, as well as software manufacturers. When working with programs, the user is obliged to comply with the legal norms related to the ownership and use of programs.

From the point of view of legal aspects, the user should know the **following types** of software:

Commercial software - it is created by a professional company, it can be bought in a store (online store), it has high-quality support, it has a low error rate.

Firmware (a special kind of commercial software) - is produced or distributed by the computer manufacturer itself; it is mostly obtained directly when buying a computer; also called OEM software.

Shareware - are programs with an initial handling fee for copying; in the case of commercial use, a symbolic amount is paid for the license to the author (the address of the author and the amount will be printed by the program at startup); it has different quality, from professional programs to amateur ones.

Freeware - is provided to all users without the right to financial settlement and copyright (games, simple programs, promotional programs - demo); its quality varies (as with shareware).

Legal aspects of PC use

Public domain - programs or source texts (codes) are provided without the right to financial compensation; they can be freely modified and used in own products (freeware does not allow this); their quality is different, usually lower.

Each user (customer) cannot, without the consent of the author:

- Use the program simultaneously on more than the agreed number of computers (mono or multilicense).
- Create another copy and sell it for use on another computer.
- Modify the program or include it as part of another program.
- He is obliged to ensure the protection of programs against abuse (store them in a safe place).
- Buys only the right to use the program. (when I buy a copy of a program, I only use it, but do not own it)
- The program purchased by him remains the property of the supplier organization.
- The operating system is purchased for each computer.
- However, he may lend a legally created working copy to another computer if he renounces the use of this program during the loan.

Legal aspects of PC use

Software manufacturers protect their software in different ways:

- Attempting to copy the program creates an unusable copy.
- Due to the special method of writing the program on the distribution medium, the program cannot be copied or read by the usual means of the operating system.
- Protection by technical (hardware) means – highly efficient and expensive program systems – the program only works with a special additional board (hardlock) that is supplied together with the program.

Laws and use of ICT

Legal protection of computer programs

The author of a computer program owns the copyright to this program. Copyright includes exclusive personal rights and exclusive property rights to a computer program

Harmful and illegal content on the Internet

The freedom of communication on the network is often abused by undisciplined and vulgar participants, violating the so-called netiquette - unwritten rules of communication on the network. Unwanted actions include mainly sending unsolicited messages, advertising, intrusion, profanity in communication, etc.

Infringement of intellectual property rights, along with trade secret infringement, are the most serious problems of the network in addition to general crime.

Laws and use of ICT

Everything is or should be regulated by law:

- **electronic communications**
- **e-shop**
- **e-signature**
- **equalization of the written and electronic form of the document** (electronic form of the document is acceptable only with guaranteed electronic signature)
- **GDPR** (General Data Protection Regulation)