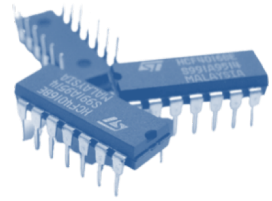




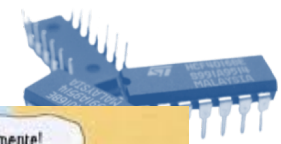
TÉCNICO LISBOA

Sistemas Digitais



Perspectiva Histórica

Prof. António Grilo

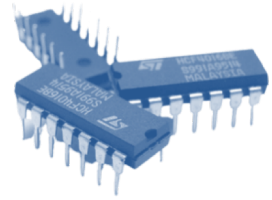


Dos primórdios da história... ... até aos computadores de hoje

Perspectiva Histórica

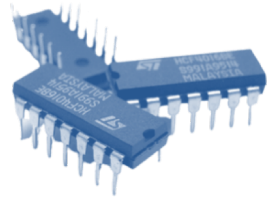


Evolução dos Computadores

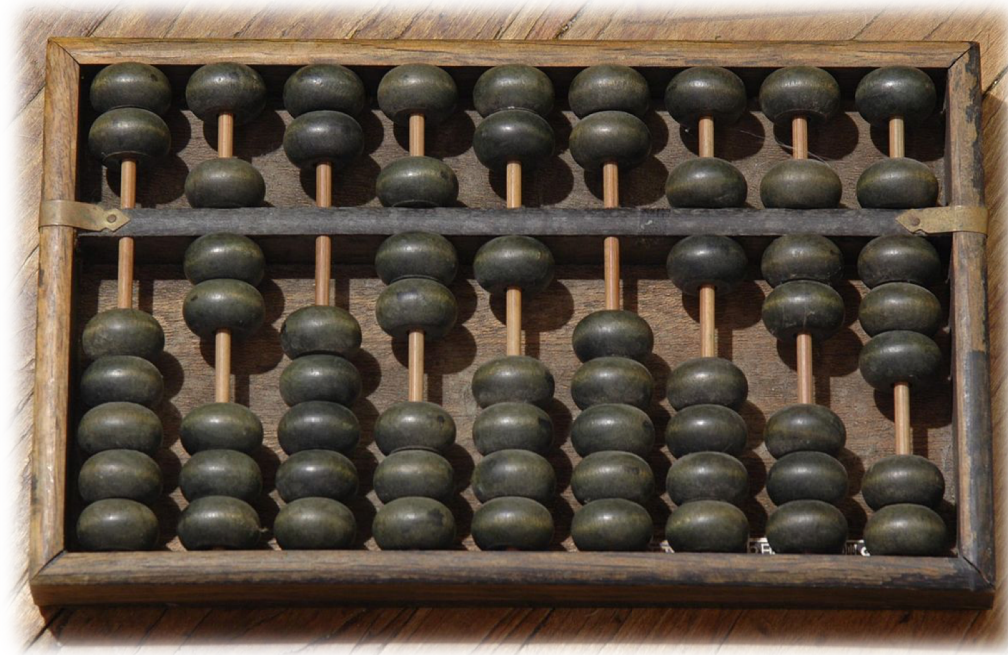


- Marcos na Evolução dos Computadores:
 - 3000AC Babilónia Ábaco

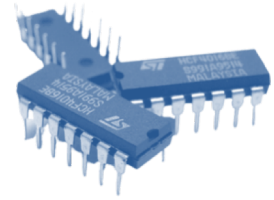
Evolução dos Computadores



- Ábaco (3000 AC)



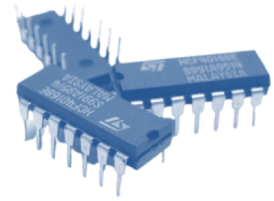
Evolução dos Computadores



- Marcos na Evolução dos Computadores:

- 4000AC Babilónia Ábaco
- 150AC Grécia Antikythera (analógico)

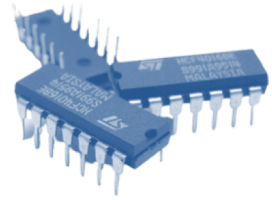
Evolução dos Computadores



- Antikythera (ca. 150 AC)



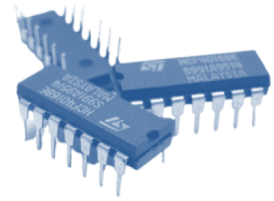
Evolução dos Computadores



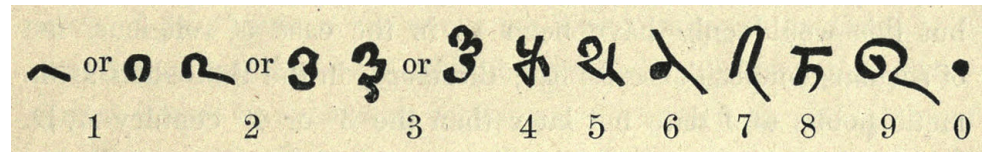
- Marcos na Evolução dos Computadores:

- 4000AC Babilónia Ábaco
- 150AC Grécia Antikythera (analógico)
- 700 Índia Algarismos Indo-Arábicos

Evolução dos Computadores



- Algarismos Indo-Arábicos



Manuscrito de Bakhshali (Índia, séc. 3º DC - séc. 7º DC)



Muḥammad ibn Mūsā al-Khwārizmī
(Pérsia; c. 780 – c. 850)

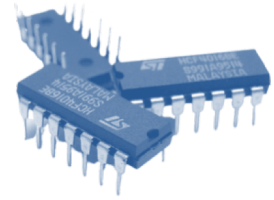


Papa Silvestre II
(Belliac, c. 946 – Roma, 12 de Maio de 1003)



Leonardo Fibonacci
(Pisa; c. 1170 – c. 1250)

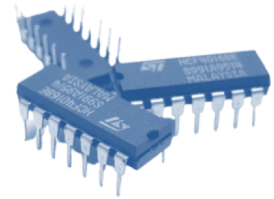
Evolução dos Computadores



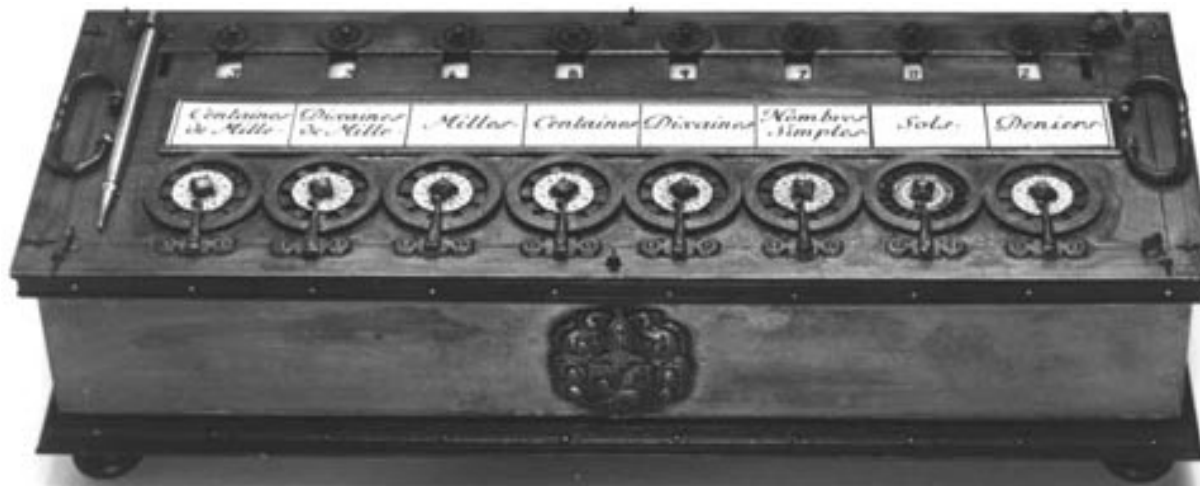
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- | | | |
|----------|---------------|--------------------------|
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| • 700 | Índia | Algarismos Indo-Arábicos |
| • 1642 | Blaise Pascal | Somador mecânico |

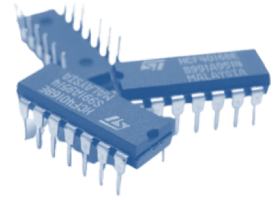
Evolução dos Computadores



- Somador mecânico (1642)



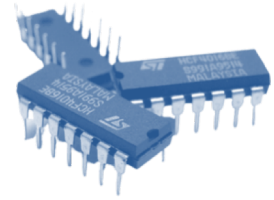
Evolução dos Computadores



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- 1642 Blaise Pascal Somador mecânico
- 1801 J-M Jacquard Máquina de tecer com padrões controlados por
perfurados

cartões



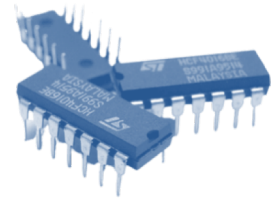
- Máquina de tecer automática (1801)



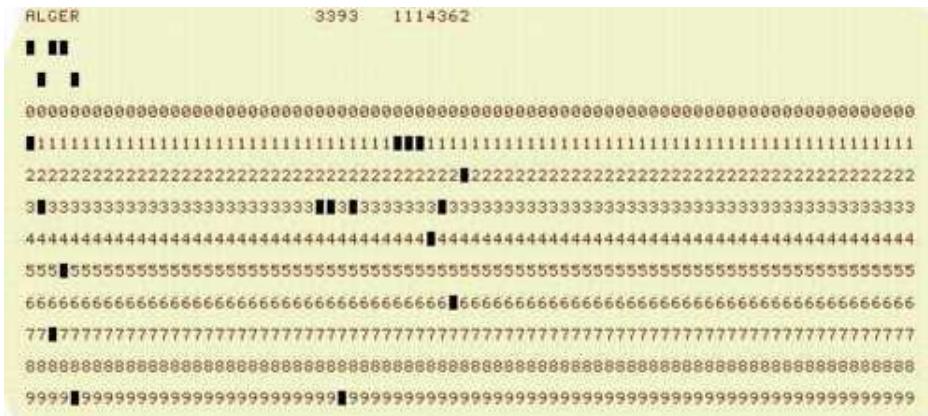
PROBLEMA:

Gerou revoltas por perdas de postos de trabalho!!!

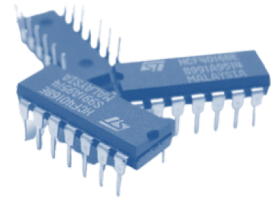
Evolução dos Computadores



- Cartão perfurado



Evolução dos Computadores



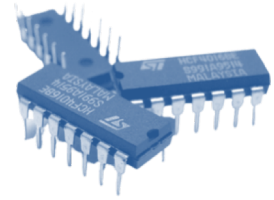
- Marcos na Evolução dos Computadores:

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| • 1801 | J-M Jacquard | Máquina de tecer com padrões controlados por perfurados | cartões |
| • 1833 | Charles Babbage | <i>Analytical Engine</i> : base dos computadores | modernos |

Na prática...

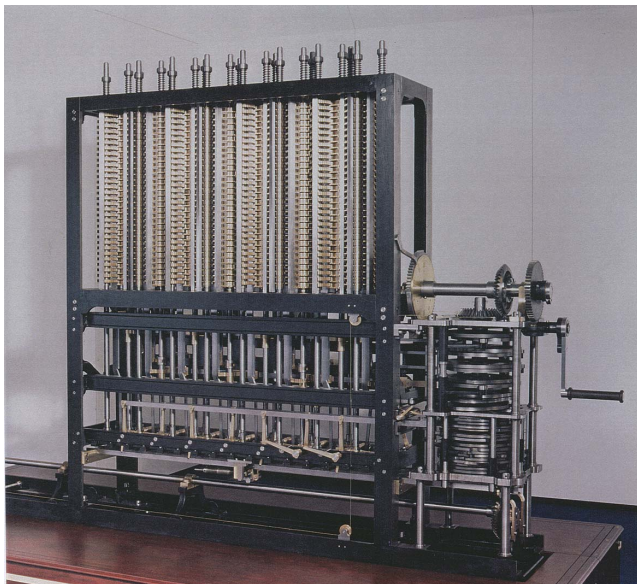
Babbage começou por desenvolver o *Differential Engine*, que tinha como base um motor a vapor para calcular qualquer função que se pudesse representar por um polinómio. Tal como os sistemas anteriores, estava limitada a uma operação.

Evolução dos Computadores

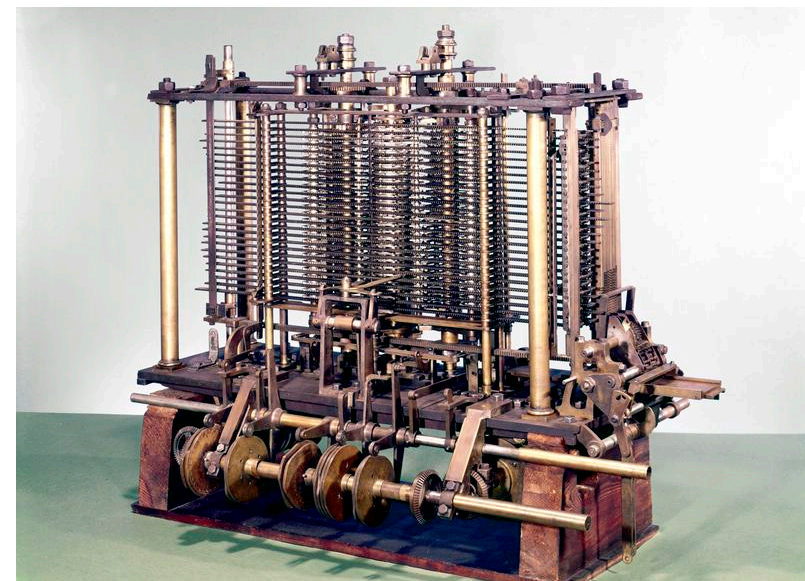


- Analytical engine (1833)

Programável com cartões perfurados.
É considerado como a base dos computadores modernos.

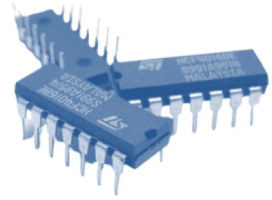


Máquina diferencial



Máquina analítica

Evolução dos Computadores

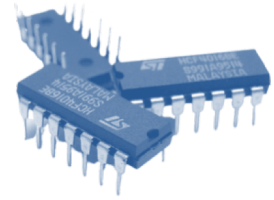


- *Ada Lovelace*



Filha do poeta e aventureiro Lord Byron. Considerada a primeira programadora de computadores devido às suas anotações sobre uma descrição do Analytical Engine, em que explica como fazer um programa para calcular números de Bernoulli.

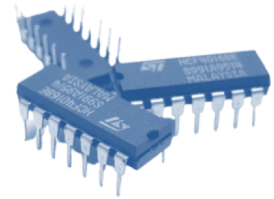
Evolução dos Computadores



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perfurados cartões
- 1833 Charles Babbage *Analytical Engine*: base dos computadores modernos
- 1854 George Boole Escreve *An Investigation to the Laws of Thought*,
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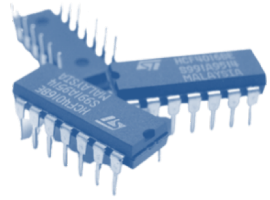
Evolução dos Computadores



• Marcos na Evolução dos Computadores:

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| • 1854 | George Boole | Escreve <i>An Investigation to the Laws of Thought</i> , sistemas lógicos | base dos |
| • 1904 | Fleming & Forest | Invenção da válvula de vácuo | |

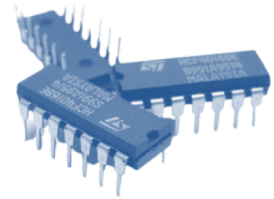
Evolução dos Computadores



- Válvula (1904)

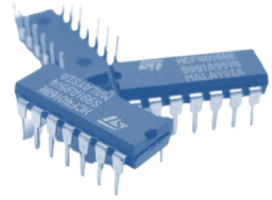


Evolução dos Computadores

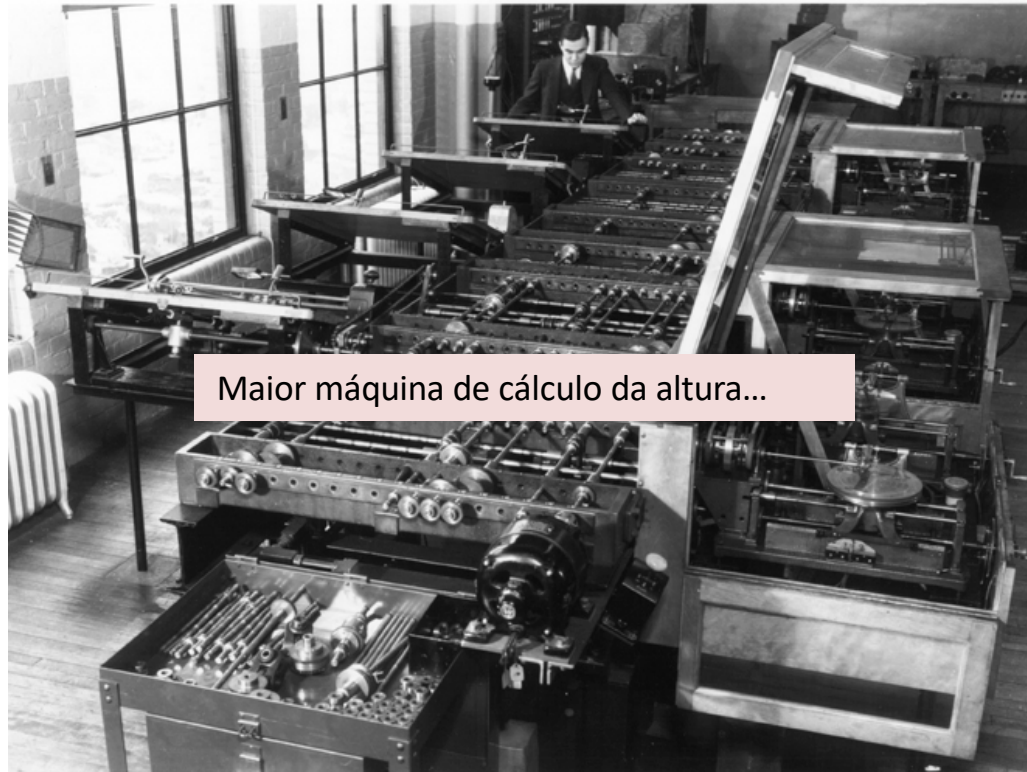


• Marcos na Evolução dos Computadores:

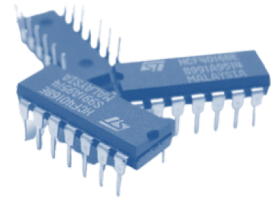
- | | | | |
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| | sistemas lógicos | | |
| • 1904 | Fleming & Forest | Invenção da válvula de vácuo | |
| • 1928 | Vannevar Bush | <i>Differential Analyzer</i> , sistema electro-mecânico | |
| | | para cálculo diferencial | |



- Differential Analyzer (1925)

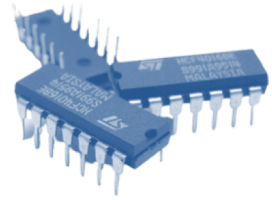


Evolução dos Computadores

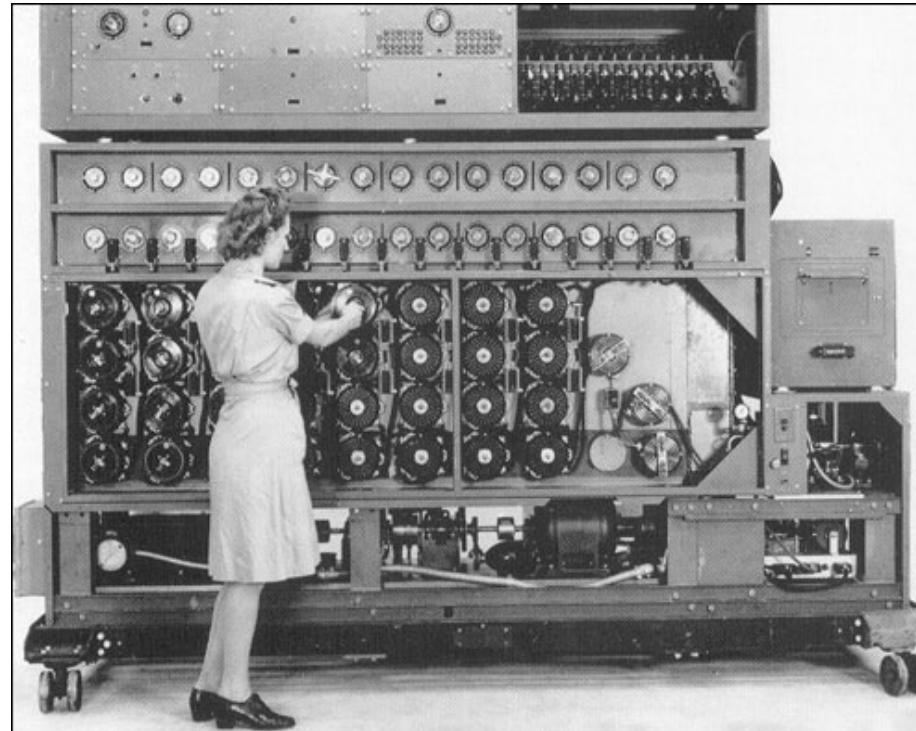


• Marcos na Evolução dos Computadores:

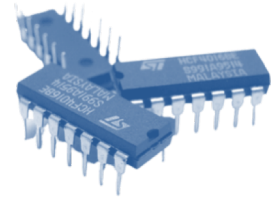
- | | | | |
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| • 1904 | Fleming & Forest | Invenção da válvula de vácuo | |
| • 1928 | Vannevar Bush | <i>Differential Analyzer</i> , sistema electrónico para | cálculo |
| diferencial | | | |
| • 1937 | Alan Turing | Escreve <i>On Computable Numbers</i> , modelo teórico | para os computadores |
| actuais | | | |



- Alan Turing's Bomb Machine (1940)



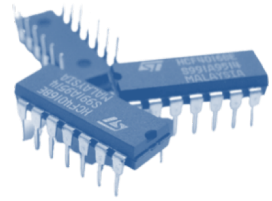
Evolução dos Computadores



- Primeiros computadores:

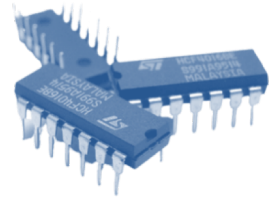
- 1938 Konrad Zuse Z1, Alemanha
- 1943 Betchley Park Colossus, Reino Unido
- 1944 Harvard Mark I, EUA
- 1945 Filadélfia ENIAC, EUA

Evolução dos Computadores

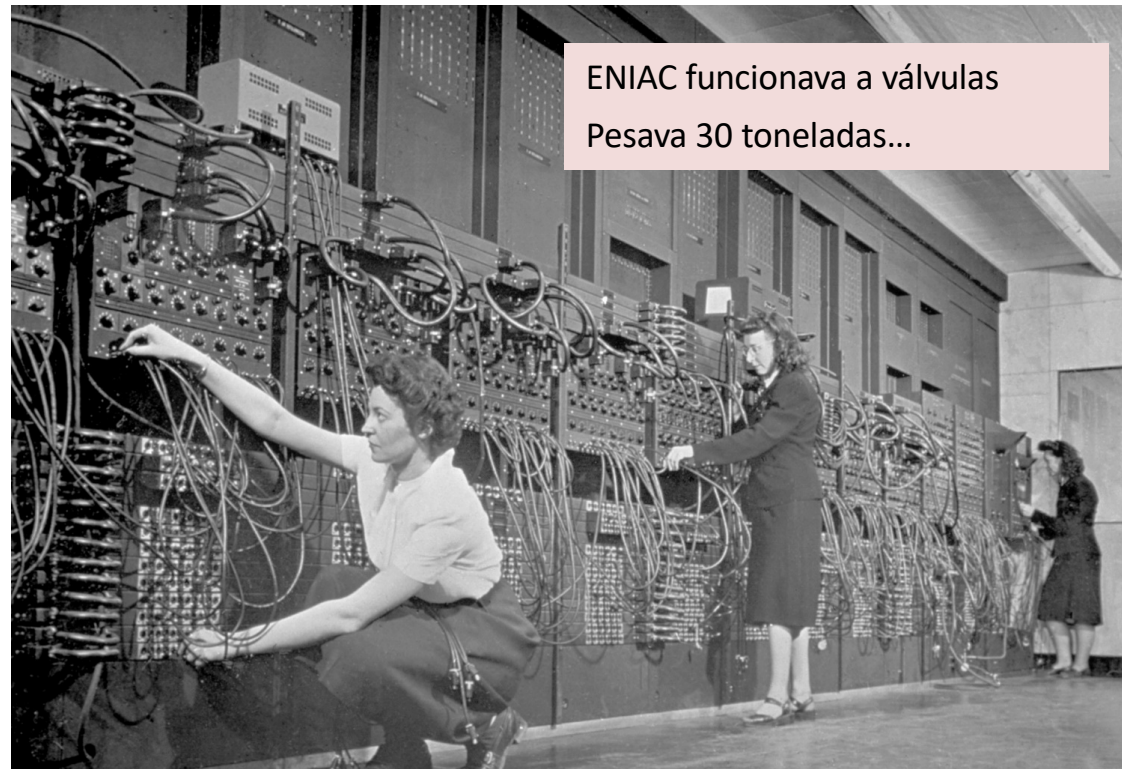


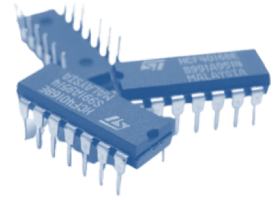
- ENIAC (1945)



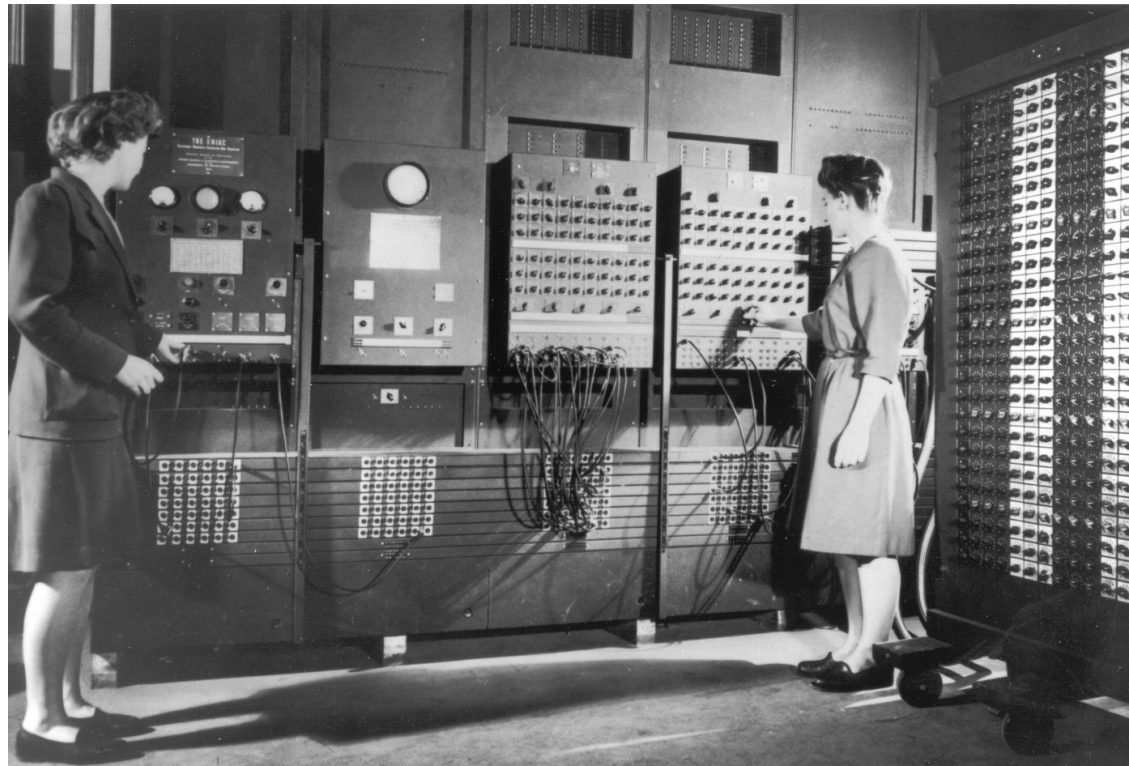


- ENIAC (1945)

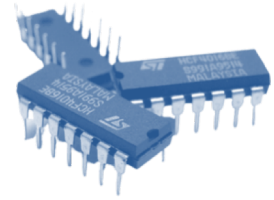




- Programação do ENIAC (1945)

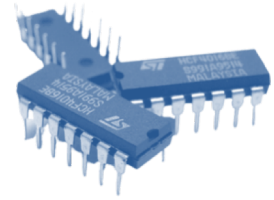


Evolução dos Computadores

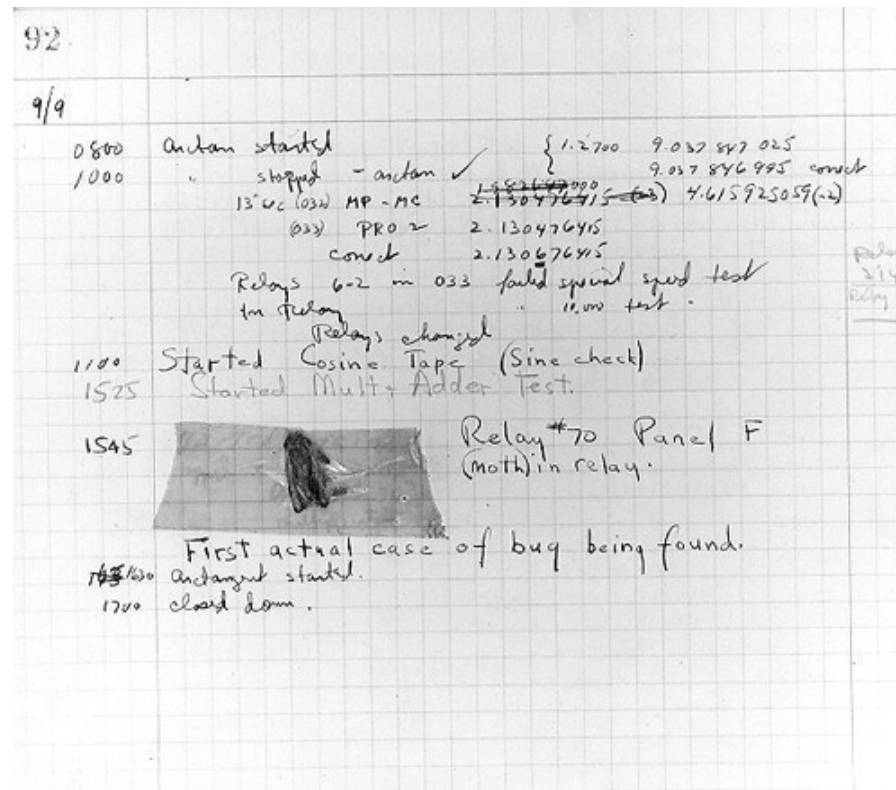


- Primeiros computadores:

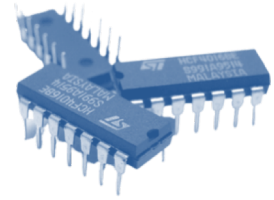
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- 1945 Filadélfia ENIAC, EUA
- 1945 Harvard Primeiro bug



- Primeiro Bug documentado (1945)



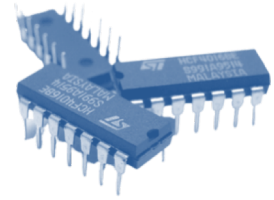
Evolução dos Computadores



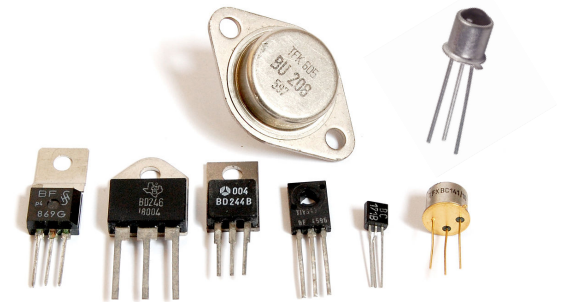
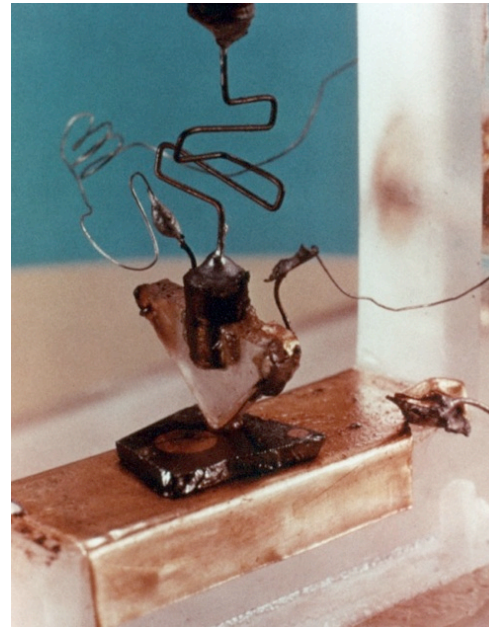
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- 1945 John von Neumann Conceito de programa em memória
- 1947 William Shockley Invenção do transistor

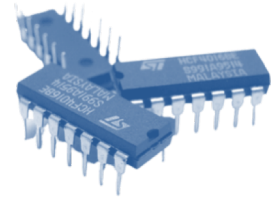
Evolução dos Computadores



- Invenção do transistor (1947)



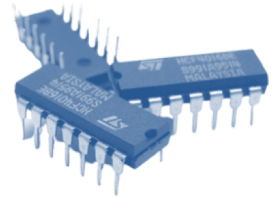
Evolução dos Computadores



- Primeiros computadores:

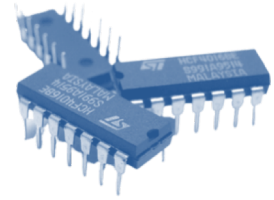
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- 1945 John von Neumann Conceito de programa em memória
- 1947 William Shockley Invenção do transistor
- 1951 UNIVAC UNIVAC I, Primeiro computador comercial

Evolução dos Computadores



- UNIVAC I – Primeiro computador pessoal (1951)

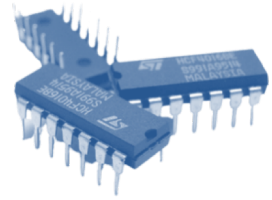




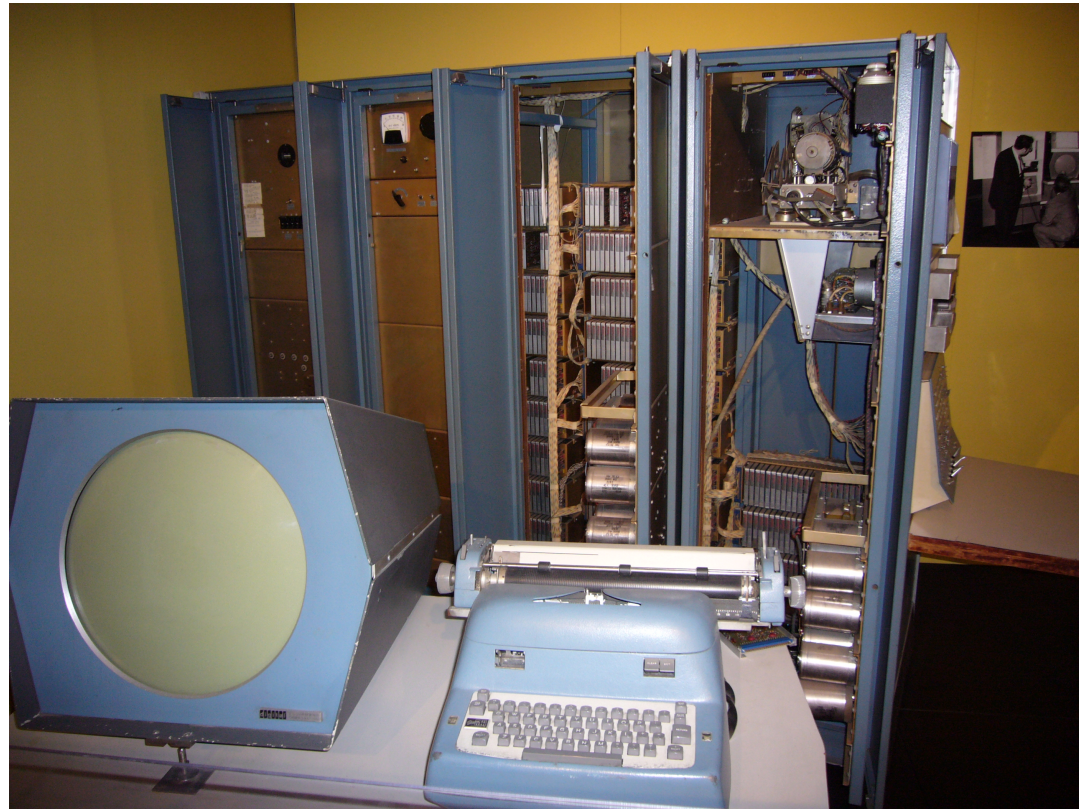
- Primeiros computadores:

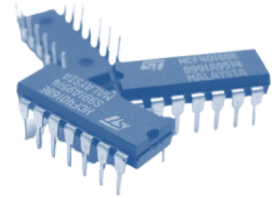
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- 1951 UNIVAC UNIVAC I, Primeiro computador comercial
- 1956 RAMAC Primeiro disco rígido
- 1958 Kilby & Noyce Invenção do circuito integrado
- 1960 DEC PDP-1, primeiro computador comercial com teclado e monitor

Evolução dos Computadores



- PDP-1 (1960)

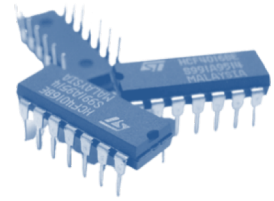




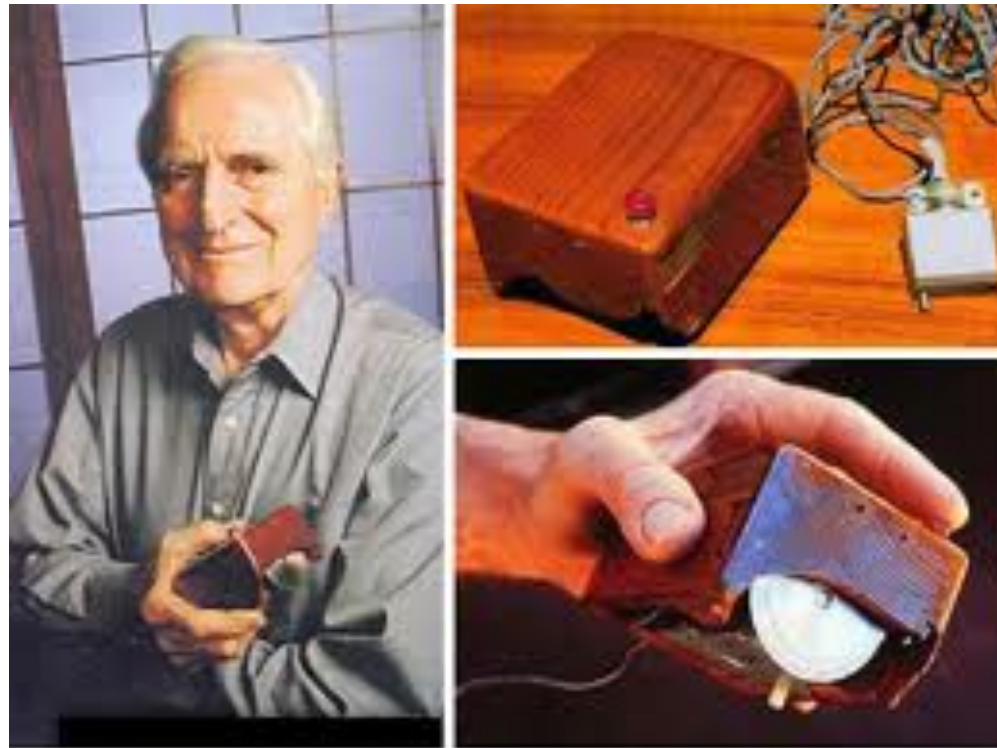
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- 1964 Douglas Engelbart Invenção do rato

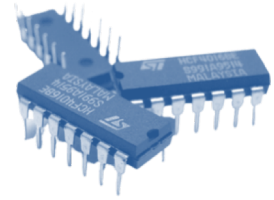
Evolução dos Computadores



- Primeiro rato (1964)



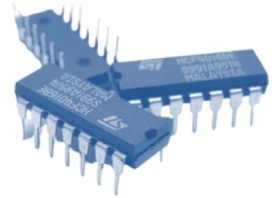
Evolução dos Computadores



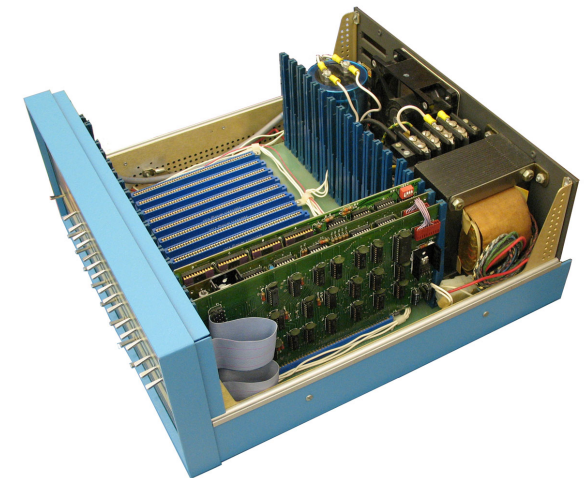
- Primeiros processadores/computadores:

- 1971 Intel 4004, microprocessador de 4 bits
- 1972 Intel 8008, microprocessador de 8 bits
- 1974 Motorola 6800, microprocessador de 8 bits
- 1974 Intel 8080, 1º microprocessador com grande procura
- 1975 Altair Altair 8800, primeiro computador pessoal

Evolução dos Computadores

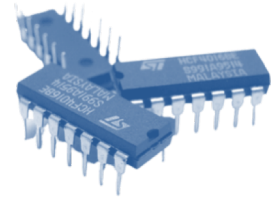


- Altair 8800 (1975)



Não tinha monitor nem teclado...
256 bytes de RAM !!!

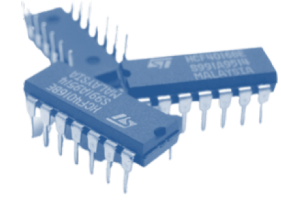
Evolução dos Computadores



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Evolução dos Computadores



- Apple II (1976)



1298 USD (1974)

The home computer that's ready to work, play and grow with you.

Clear the kitchen table. Bring in the color T.V. Plug in your new Apple II™ and connect any standard cassette recorder/player. Now you're ready for an evening of discovery in the new world of personal computers.

Only Apple II makes it that easy. It's a complete, ready to use computer—not a kit. At \$1298, it includes features you won't find on other personal computers costing twice as much.

history or math. But the biggest benefit—no matter how you use Apple II—is that you and your family increase your familiarity with the computer itself. The more you experiment with it, the more you discover about its potential.

Start by playing PONG. Then invent your own games using the input keyboard, game paddles and built-in speaker. As you experiment you'll acquire new programming skills which will open up new ways to use your Apple II. You'll learn to "paint" dazzling color displays using the unique color graphics commands in Apple BASIC, and write programs to create beautiful kaleidoscopic designs.

As you master Apple BASIC, you'll be able to organize, index and store data on household finances, income tax, recipes, and record collections. You can learn to chart your baby's growth, balance your checking account, even control your home environment. Apple II will go as far as your imagination can take it.

Best of all, Apple II is designed to grow with you. As your skill and experience with computing increase, you may want to add new Apple peripherals. For example, a refined, more sophisticated BASIC language is being developed for advanced scientific and mathematical applications.

And in addition to the built-in audio, video and game interfaces, there's room for eight plug-in options such as a prototyping board for experimenting with interfaces to other equipment; a serial board for connecting teletype, printer and other terminals; a parallel interface for communicating with a printer or another computer; an EPROM board for storing programs permanently; and a modem board communications interface. A floppy disk interface with software and complete operating systems will be available at the end of 1977. And there are many more options to come, because Apple II was designed from the beginning to accommodate increased power and capability as your requirements change.

Features such as video graphics in 15 colors. And a built-in memory capacity of 8K bytes ROM and 4K bytes RAM—with room for lots more. But you don't even need to know a RAM from a ROM to use and enjoy Apple II. It's the first personal computer with a fast version of BASIC—the English-like programming language—permanently built in. That means you can begin running your Apple II the first evening, entering your own instructions and watching them work, even if you've had no previous computer experience.

The familiar typewriter-style keyboard makes communication easy. And your programs and data can be stored on (and retrieved from) audio cassettes, using the built-in cassette interface, so you can swap with other Apple II users. This and other peripherals—optional equipment on most personal computers, at hundreds of dollars extra cost—are built into Apple II. And it's designed to keep up with changing technology, to expand easily whenever you need it to.

As an educational tool, Apple II is a sound investment. You can program it to tutor your children in most any subject, such as spelling,

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Apple II™ is a completely self-contained computer system with BASIC in ROM, color graphics, ASCII keyboard, lightweight, efficient switching power supply and molded case. It is supplied with BASIC in ROM, up to 48K bytes of RAM, and with cassette tape, video and game I/O interfaces built-in. Also included are two game paddles and a demonstration cassette.

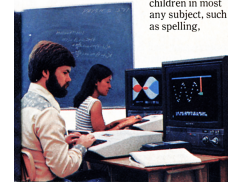
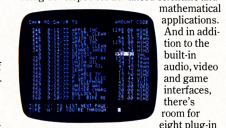
- SPECIFICATIONS**
- **Microprocessor:** 6502 (1 MHz).
 - **Video Display:** Memory mapped, 5 modes—all Software-selectable:
 - Text—40 characters/line, 24 lines upper case.
 - Color graphics—40h x 48h, 15 colors
 - High-resolution graphics—280h x 192v: black, white, violet, green (16K RAM minimum required)
 - Both graphics modes can be selected to include 4 lines of text at the bottom of the display area.
 - Completely transparent memory access. All color generation done digitally.
 - **Memory:** up to 48K bytes on-board RAM (4K supplied)
 - Uses either 4K or new 16K dynamic memory chips
 - Up to 12K ROM (8K supplied)
 - **Software**
 - Fast extended Integer BASIC in ROM with color graphics commands
 - Extensive monitor in ROM
 - **I/O**
 - 1500 bps cassette interface
 - 8-slot motherboard
 - Apple game I/O connector
 - ASCII keyboard port
 - Speaker
 - Composite video output

Apple II is also available in board-only form for the do-it-yourself hobbyist. Has all of the features of the Apple II system, but does not include case, keyboard, power supply or game paddles. \$798.

Apple II is a trademark of Atari Inc. *Apple II plugs into any standard TV using an inexpensive modulator (not supplied).

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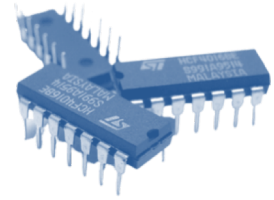
detailed brochure. Or write Apple Computer Inc., 20860 Stevens Creek Blvd., Cupertino, California 95014.



Circle 4 on inquiry card.

apple computer inc.

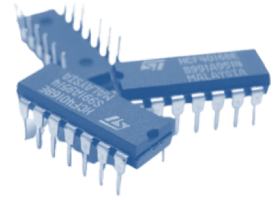
Evolução dos Computadores



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- 1978 Intel 8086/8088, microprocessador de 16 bits
- 1979 Motorola 68000, microprocessador de 16 bits
- 1981 IBM Lançamento do PC

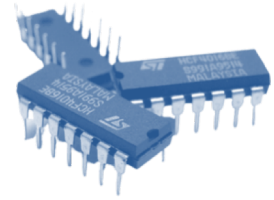
Evolução dos Computadores



- IBM PC (1981)



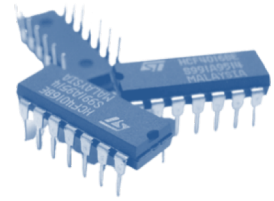
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- 1981 IBM Lançamento do PC
- 1982 Sinclair ZX Spectrum, 1º computador de baixo custo com grande procura (UK)

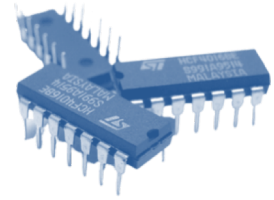
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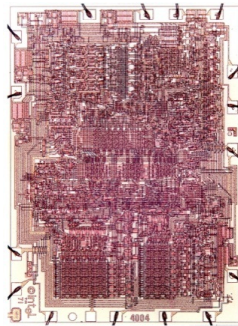
- ZX Spectrum (1982)



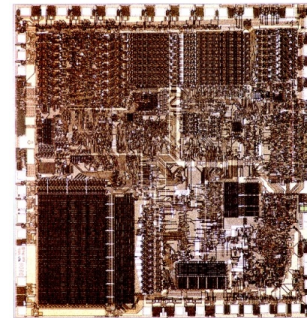
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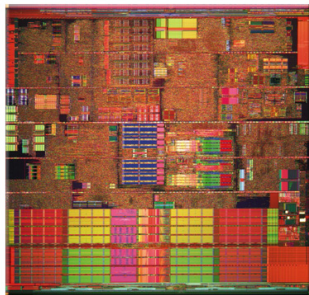
- Layout de processadores da INTEL:



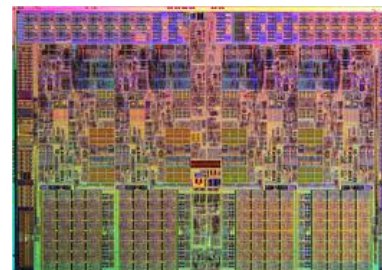
INTEL 4004
Ano: 1971
Freq.: 108 kHz
2.300 Trans.



INTEL 8086
Ano: 1978
Freq.: 5 MHz
29.000 Trans.

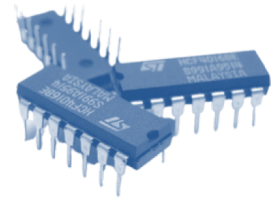


INTEL Pentium 4
Ano: 2000
Freq.: 1,5 GHz
42.000.000 Trans.



INTEL Core i9 (deca)
Ano: 2017
Freq.: 5 GHz
1.736.000.000 Trans.

Evolução dos Computadores



- Circuitos integrados processadores da INTEL:



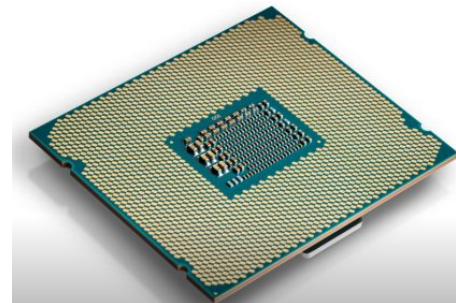
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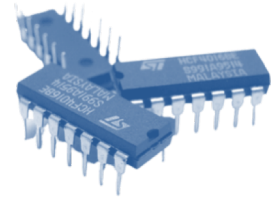
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- Frases famosas:

- *“Everything that can be invented has been invented.”*
Charles H. Duel, US Commissioner of Patents, 1899
- *“I think there is a world market for maybe five computers.”*
Thomas Watson, chairman of IBM, 1943
- *“Computers in the future may weigh no more than 1.5 tons.”*
Popular Mechanics, 1949
- *“There is no reason anyone would want a computer in their home.”*
Ken Olson, president, chairman and founder of DEC, 1977
- *“640K ought to be enough for anybody.”*
Bill Gates, 1981



TÉCNICO LISBOA