I calcolatori: dai primi a quelli super

Storia dell'Informatica
a.a. 2017/18

contenuti

- Cos'è un calcolatore
- I "primi": ENIAC, Baby, EDSAC...
- I "primi" commerciali: LEO, UNIVAC, IBM...
- Grandi, davvero
- Dalle mille valvole ai transistor, ai super

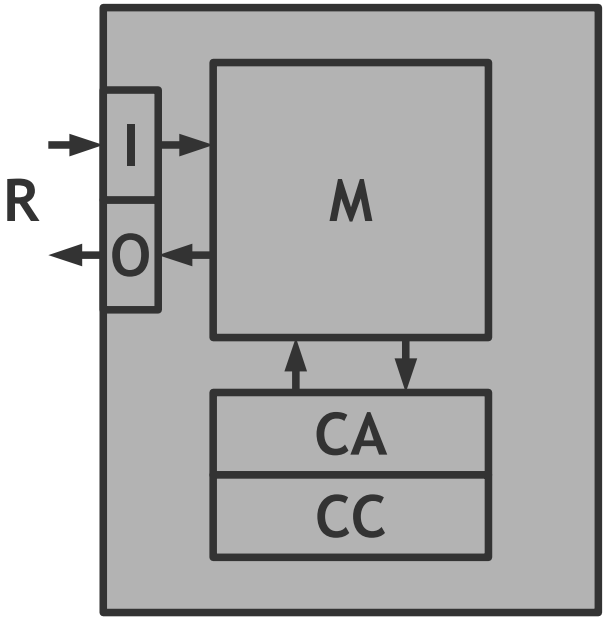
cosa fa, 1936

- David Hilbert e i 23 problemi
  - Kurt Gödel e i suoi teoremi
  - Il problema di decisione
- Alonso Church
  - Lambda calcolo
- Alan Turing
  - M. di T. universale
- E anche
  - Russel, Dedekind, Post, Kleene...

come è fatto, 1945

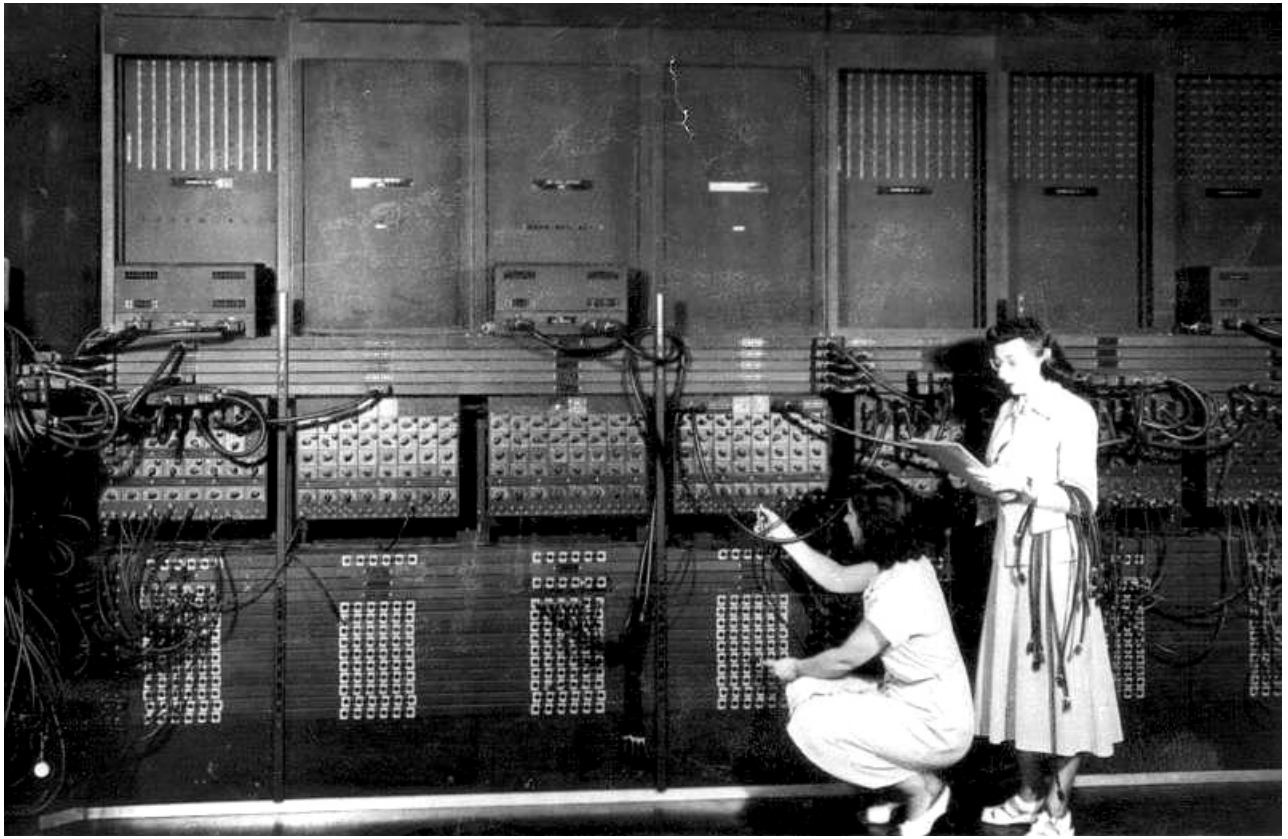
- First Draft of a Report on the EDVAC
  - John Von Neumann, Hermann Goldstine, 24 copie
  - Univ. of Pennsylvania, Moore School of Electrical Eng.
  - John Mauchly & Presper Eckert ENI/EDVAC Proj.

- 5 parti + un supporto
  - CA, central arithmetic
  - CC, central control
  - M, memory
  - I, input, da R in M
  - O, output, da M su R
  - R, recording media



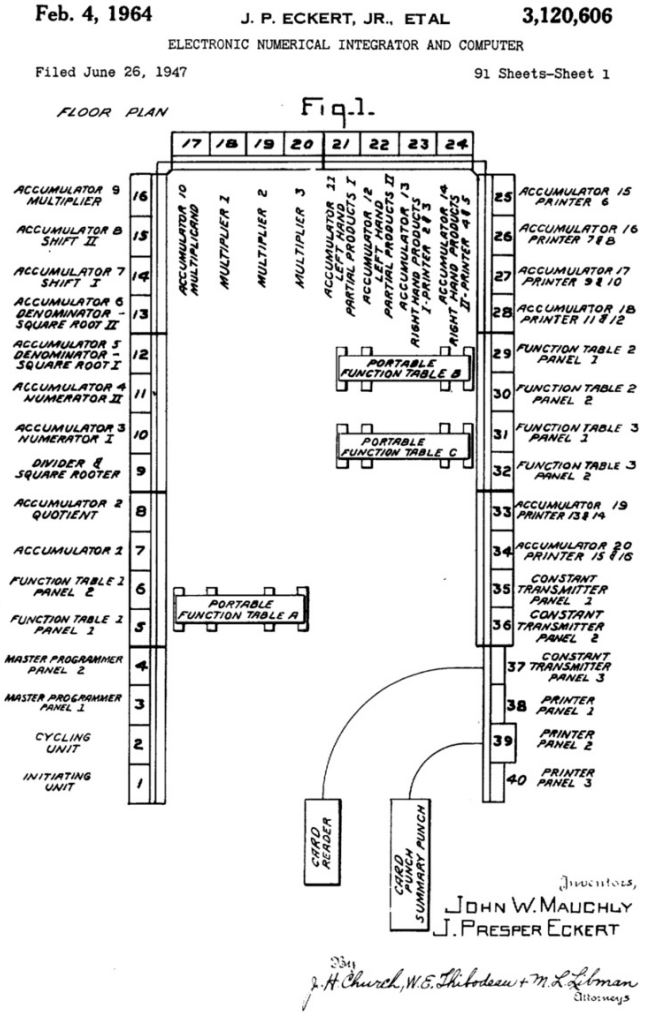
ENIAC, 1946-47

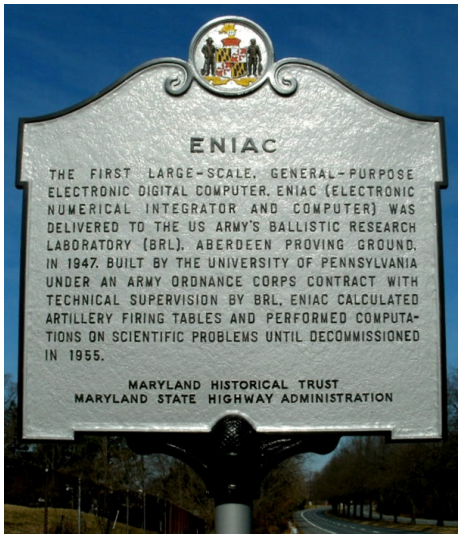
- Progetto
  - 1943 inizio
  - 1946 completato
  - 1947 consegnato
  - 1955 spento



primo?

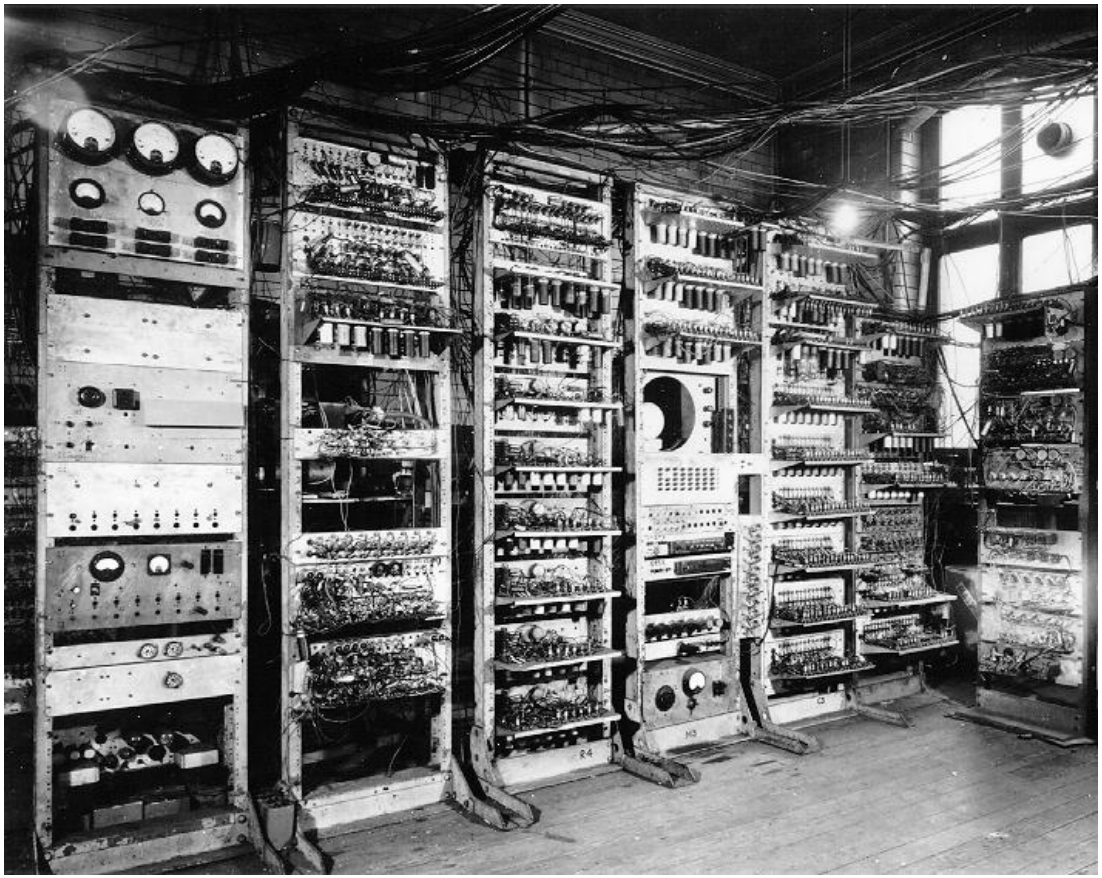
- Caratterisitiche
  - Valvole (17k)
  - Anche relé
  - 150 KW
  - Decimale
  - Schede perforate
  - 5000 op/sec
  - “Parallelo”
  - Progammabile via hardware





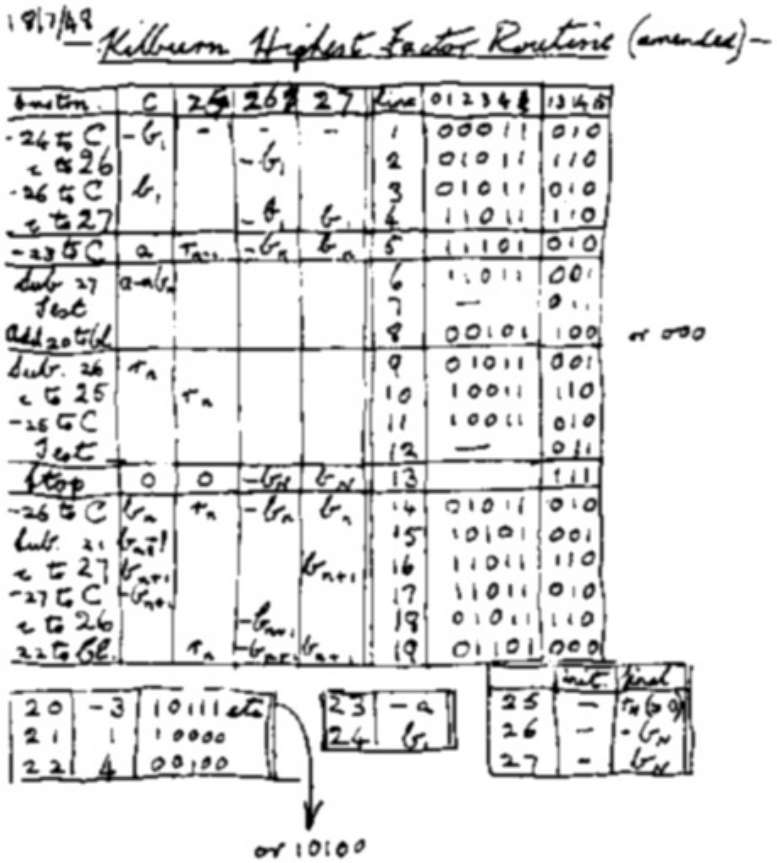
Manchester Baby, 1948

- SSEM
  - Mx Newman
  - Tom Kilburn
  - Fread Williams
- Memoria unica
  - Tubi catodici
  - Prototipo
  - Manchester Mk1
  - Ferranti Mk1 e 1*
- Su Nature



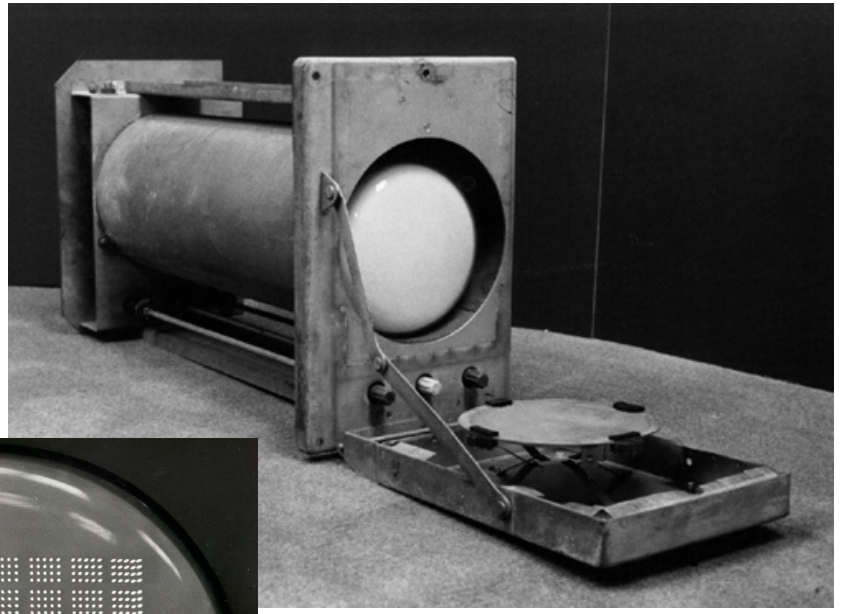
primo?

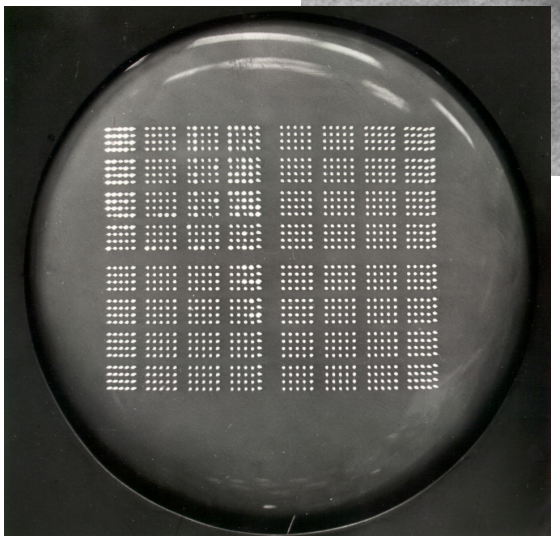
- Giugno ’48
  - Il più alto divisore di n
  - Tentativi iterativi, sottrazioni e controllo sul resto
  - $n = 2^{18}$ 3.5M op. in 52’



tubi Williams

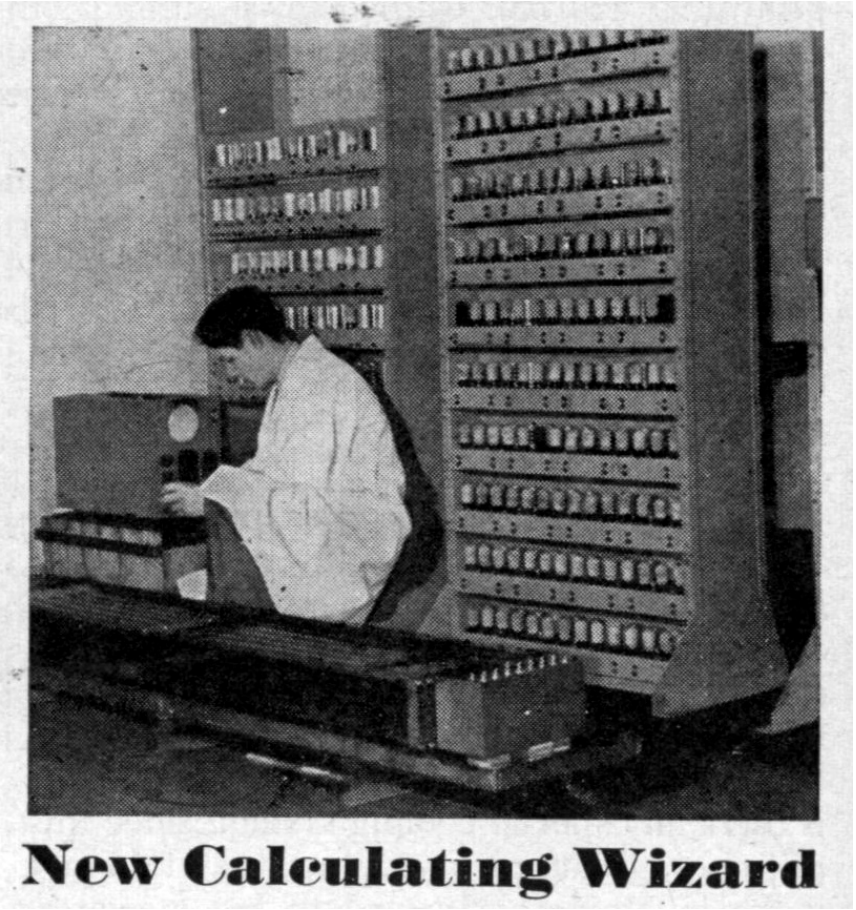
- Persistenza dei fosfori
  - Scrittura, facile
  - Lettura
    per tentata scrittura
  - Obbligo
    di refresh
    (con lettura)
  - Banchi
    ispezionabili
    duplicando
    il refresh





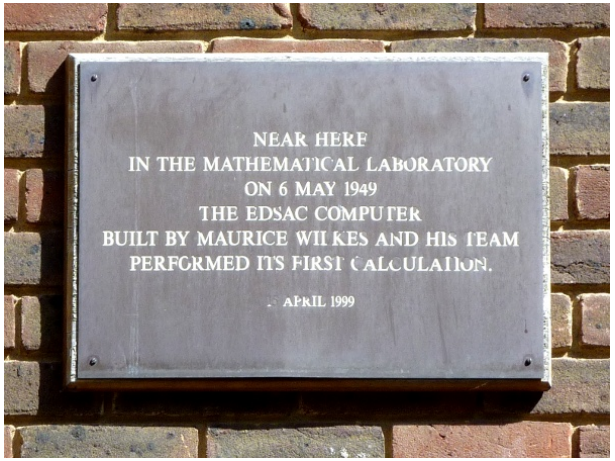
Cambridge EDSAC, 1949

- Progetto
  - Maurice Wilkes
  - David Wheeler
- Caratteristiche
  - Linee di ritardo
  - Initial Orders
  - Wheeler Jump
  - Nastri e telescriventi
  - Citato da Fred Hoyle, in The Black Cloud



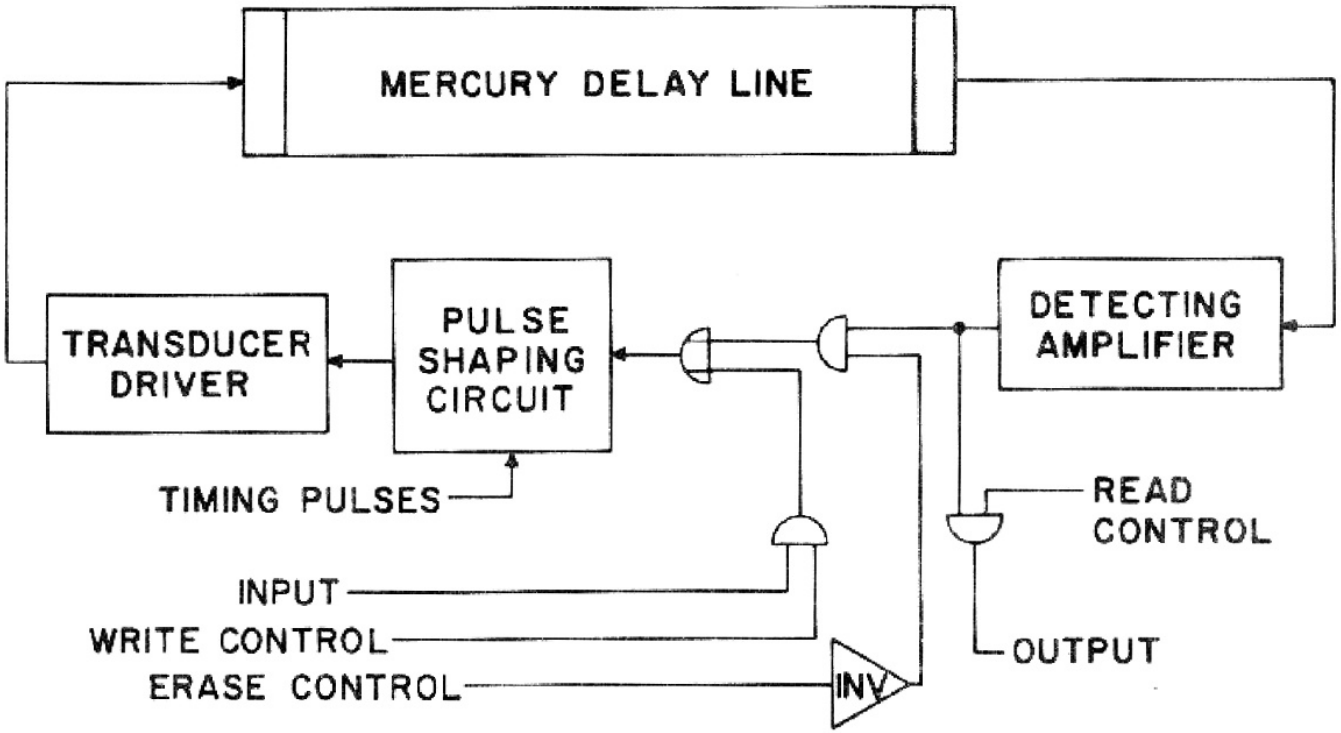
primo?

- Usato
  - Gestione degli utenti
  - 87 subroutine nel 1951



linee di ritardo

- Diverse velocità di propagazione di un segnale



e inoltre (fra gli altri)

- CSIR Mk1, novembre 1949, Sidney
  - Counsil of Scientific & Industrial Research
  - Trevor Percey. Suonò, è il più antico conservato
- МЭСМ (MESM), 1950, Kiev
  - Small Electronic Calculating Machine,
  - Sergei A. Lebedev
- Pilot ACE, 1950, London
  - Automatic Computer Engine, NPL, Turing
- IAS Machine, 1951, Princeton
  - Institute for Advanced Study, Von Neumann

Lyons

- Catena
  - Alimentari, the, biscotti
  - Ristoranti
  - Corner House
  - Dal 1894
- Organizzata
  - Centro meccanografico
  - Finanziatore di Cambridge

LEO, 1951

- Contatti con EDSAC
  - Via Goldstine
  - Fondi per 3000 £ e un ingegnere
- Electronic Office
  - Uso interno, 1951
  - Produzione, 1954
  - 2k parole 35 bit
  - 4 volte l'EDSAC
  - Nastri e telescriventi
  - Schede perforate

Ferranti Mk1 e 1*, 1951-54

- Caratteristiche
  - 20 bit
  - 8 x 64 banchi
  - tamburo magnetico
  - nastri perforati
- 2+7 consegnati
  - Più antica musica registrata
  - Dama, scacchi, testi...

UNIVAC, 1951

- Universal Automatic Computer
  - Eckert-Mauchly Computer Corporation.
  - 1949, BINAC, alla Northrop
  - 1950, vendita alla Remington Rand
  - 1951, consegnato al Census Office

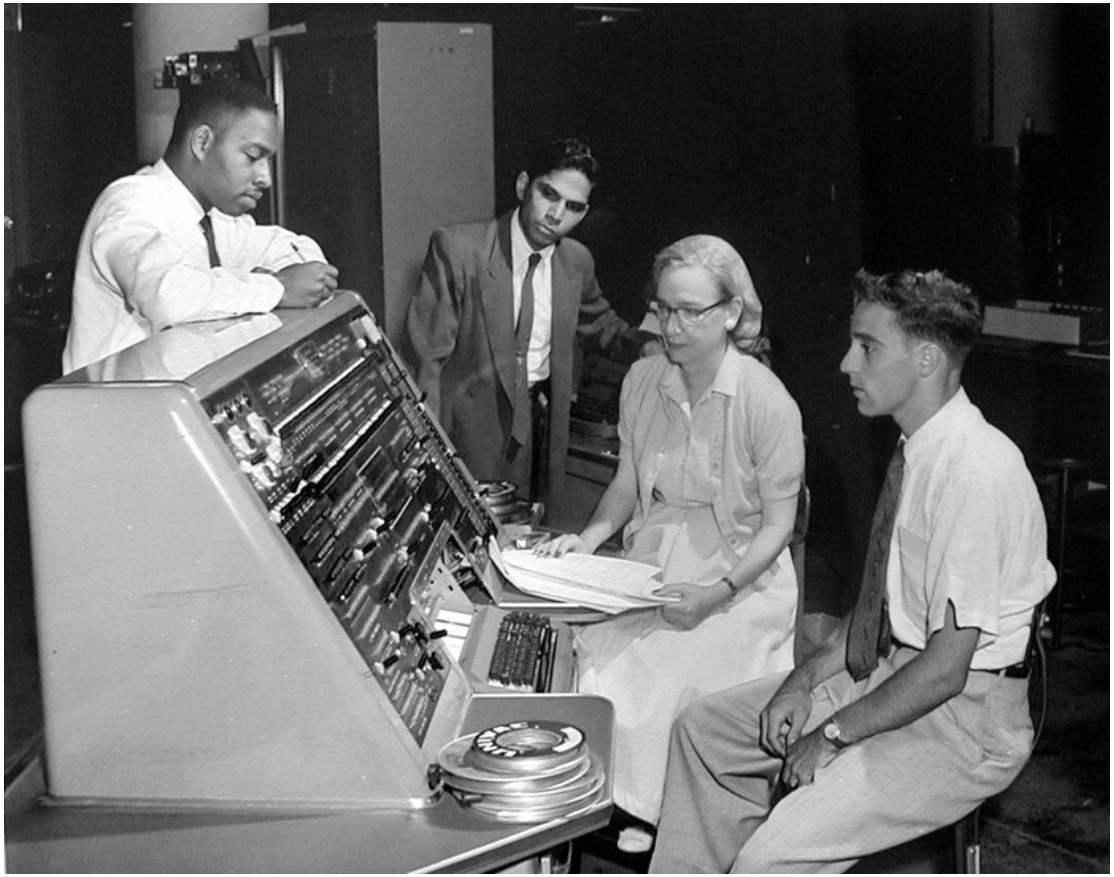
- Nastri magnetici

Ferranti vs...

... UNIVAC

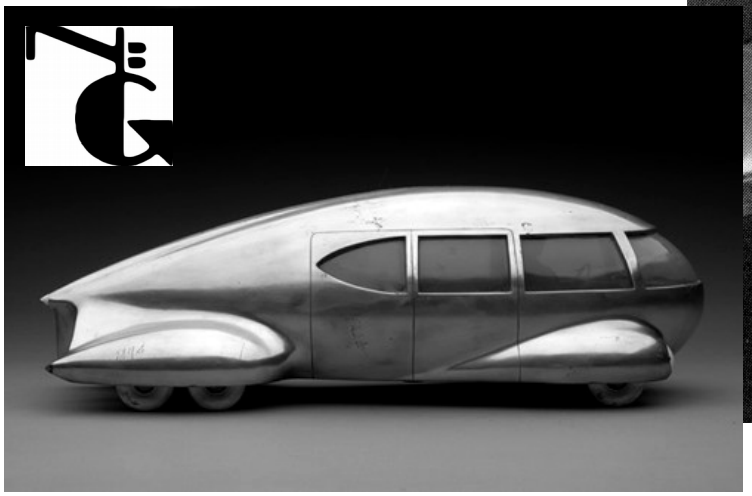
linguaggi (!)

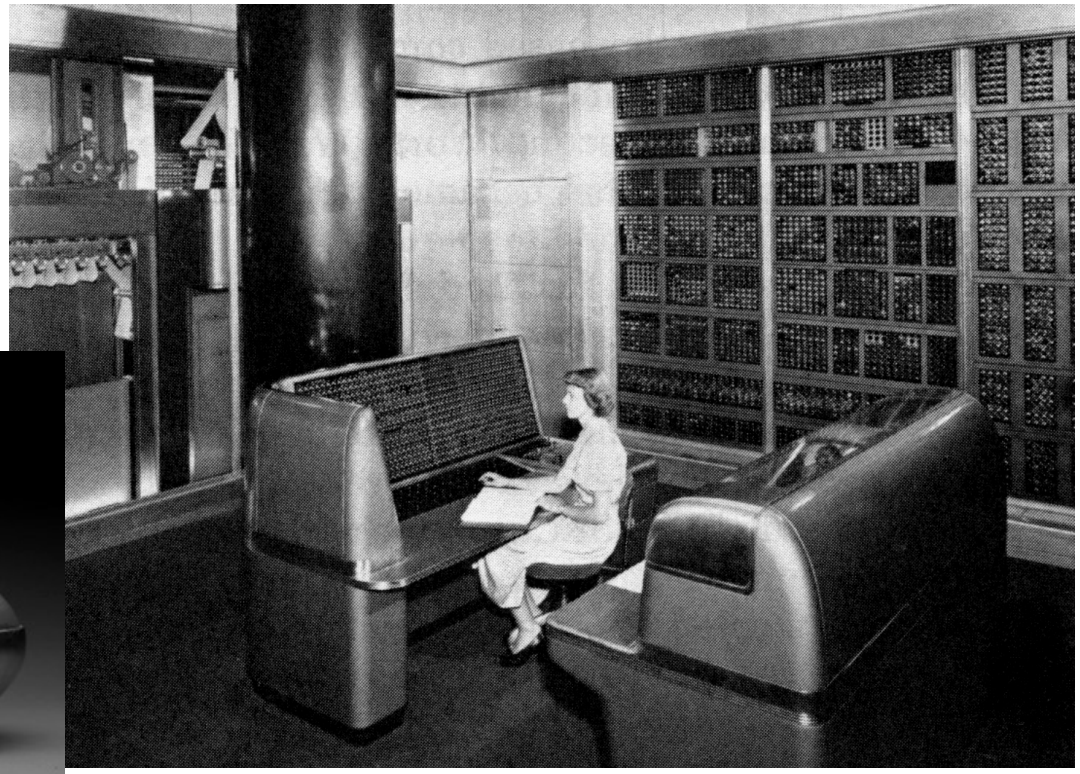
- A-0
  - Loader & linker
  - Grace Hopper
- Seguiranno
  - A-3 Arith-matic
  - AT-3 Math-matic
  - B-0 Flow-matic
- 1951-55



IBM dopo Harvard

- Selective Sequence Electronic Calculator, 1948
  - Senza Harvard
  - Wallace Eckert
  - Elettronico in parte
  - Curato ed esibito





il “Defense Computer”

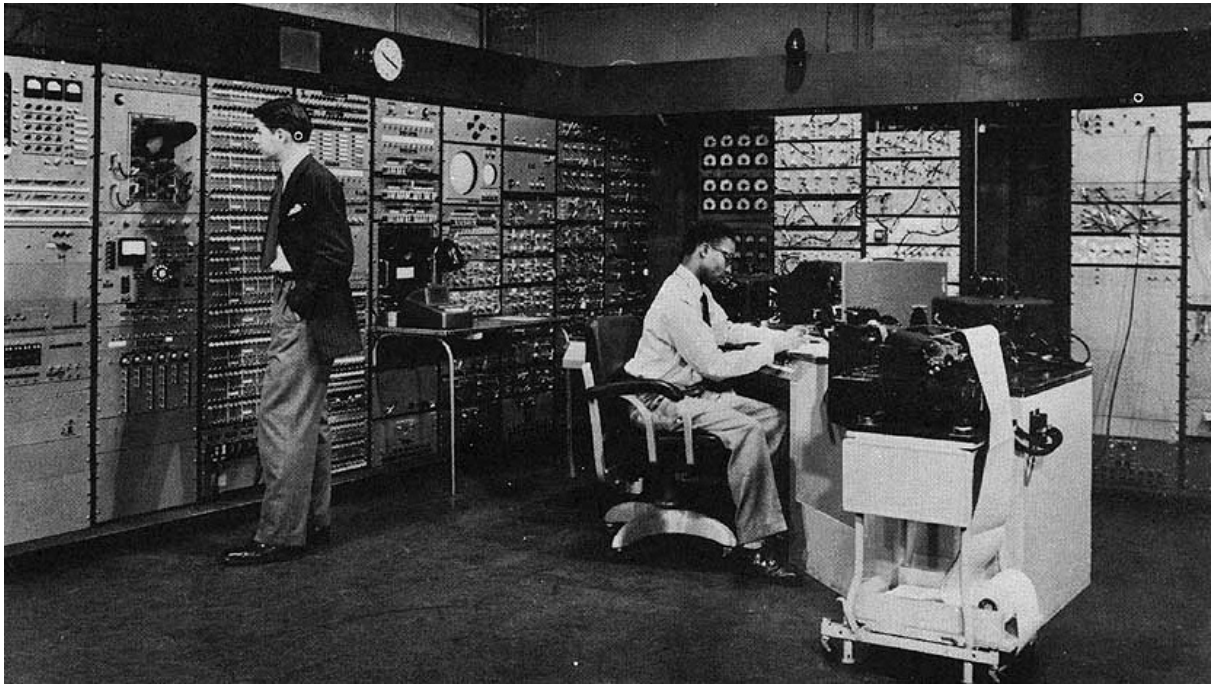
- IBM 701, 1952
  - Calcolatore scientifico commerciale
  - Finanziato dalla difesa
  - Derivato dallo IAS
  - Noleggiato 15-20000$/mese
- “Al mondo ne bastano 5”
  - Attribuita a T. Watson Sr
  - Affermazione, ben diversa, di T. Watson Jr

film riparatore, 1957

- Il timore dei calcolatori
  - Una professione a rischio
  - IBM evita “computer”
- Un mezzo efficace
  - Phoebe & Henry Ephron
  - Walter Lang, regia
  - Electromagnetic Memory and Research Arithmetical Calculator, Emma
  - Ovvio lieto fine

il Whirlwind, 1949-53ca

- MIT, per l'US Navy, simulatore di volo
  - Parallelo, 16 bit
  - Tentativo con tubi catodici
  - Memorie a nuclei di ferrite
  - Tempo reale



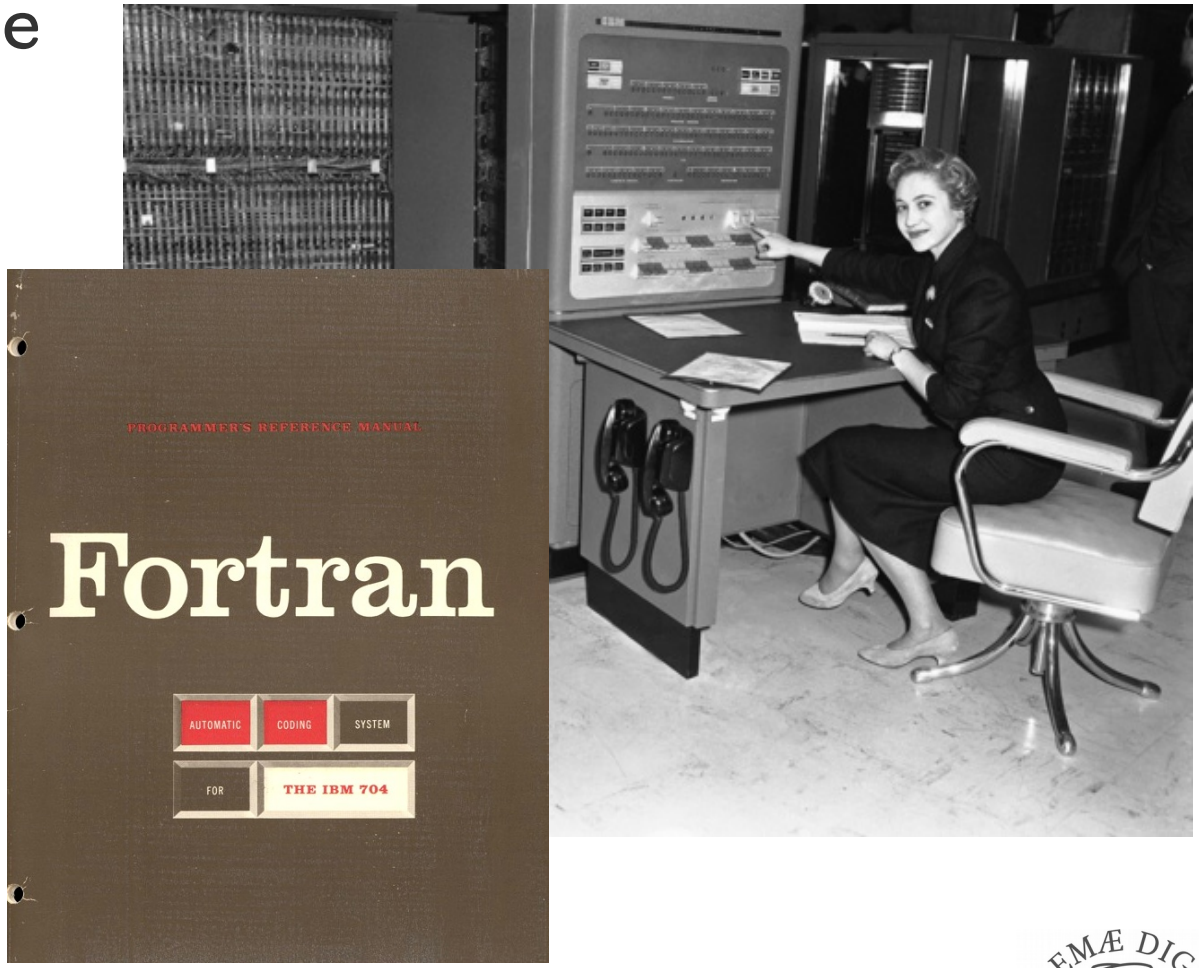
- Successori
  - TX-0/1, PDP1
  - AN/FSQ-7

nuclei di ferrite

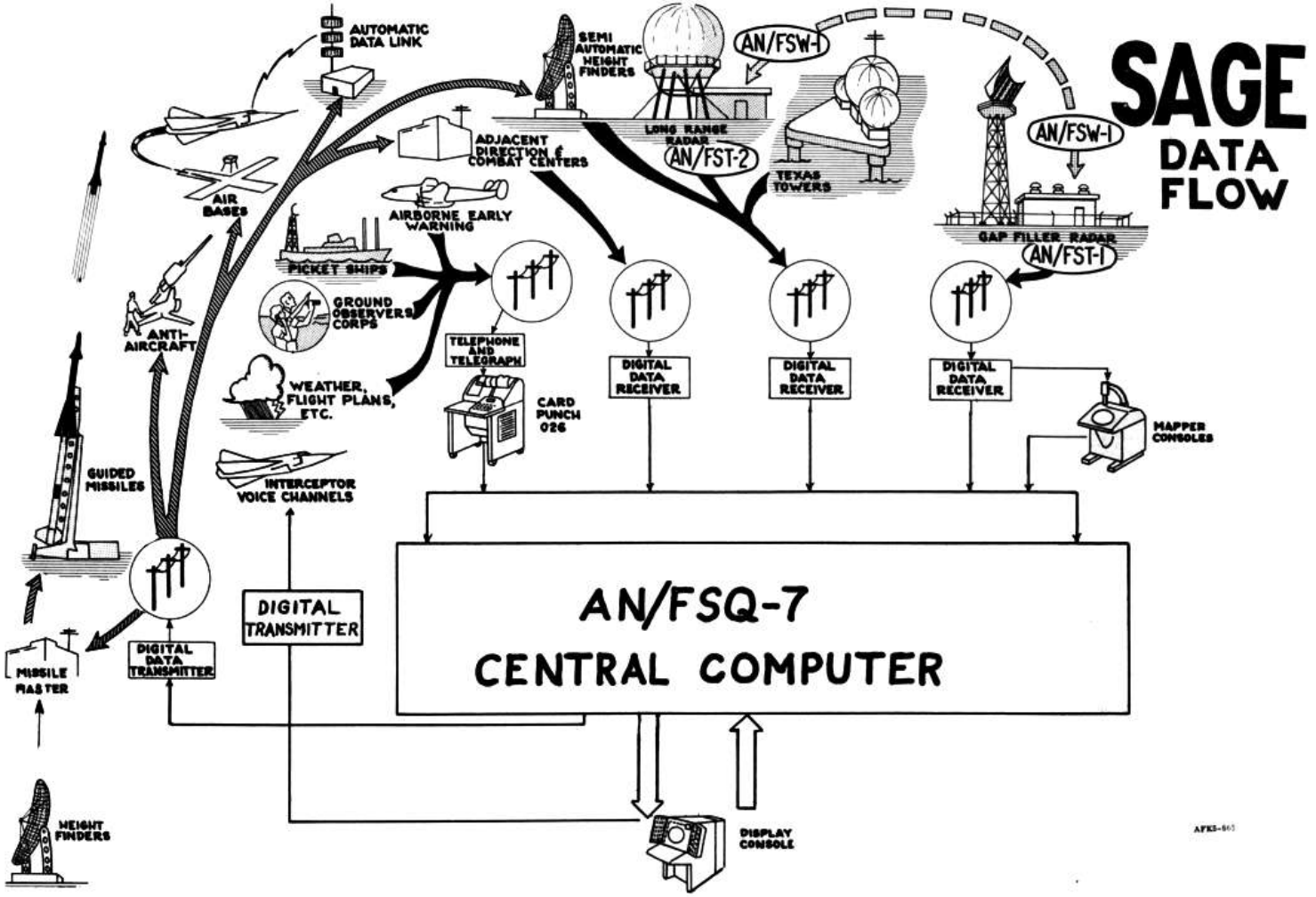
- Whirlwind, 1951
  - Jay Forrester
  - Dudley Allen Buck
- Memorie Tormac, 1955
  - Seeburg V200
- An Wang, 1955
  - US Patent 2708722
  - Sottomesso 1949
  - Infine acquistato da IBM

il 704 e il Fortran

- Il supercalcolatore
  - 4096 x 36 bit
  - 12000 add/sec
- Usato per
  - Fortran
    John Backus
  - LISP
    John McCarthy
    Steve Russel
  - MUSIC
    Max Mattews

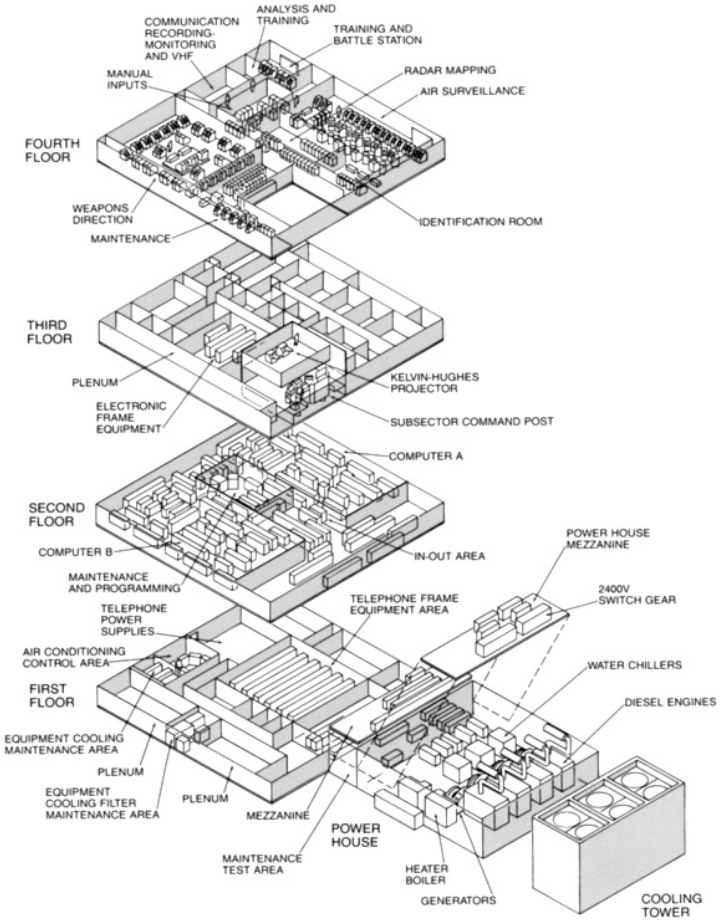


SAGE, 1958-66


SAGE
DATA
FLOW
AUTOMATIC DATA LINK
SEMI AUTOMATIC HEIGHT FINDERS
AN/FSW-1
LONG RANGE RADAR
AN/FST-2
TEXAS TOWERS
AN/FSW-1
GAP FILLER RADAR
AN/FST-1
ADJACENT DIRECTION & COMBAT CENTERS
AIR BASES
AIRBORNE EARLY WARNING
PICKET SHIPS
GROUND OBSERVERS CORPS
ANTI-AIRCRAFT
WEATHER, FLIGHT PLANS, ETC.
TELEPHONE AND TELEGRAPH
CARD PUNCH 026
DIGITAL DATA RECEIVER
DIGITAL DATA RECEIVER
DIGITAL DATA RECEIVER
MAPPER CONSOLES
GUIDED MISSILES
INTERCEPTOR VOICE CHANNELS
DIGITAL TRANSMITTER
AN/FSQ-7
CENTRAL COMPUTER
MISSILE MASTER
DIGITAL DATA TRANSMITTER
HEIGHT FINDERS
DISPLAY CONSOLE

un SAGE DC

- Lungo la Pinetree Line
  - Direction Center (32-)
    Control Center (7+2)
  - Ogni DC, 2 AN/FSQ7

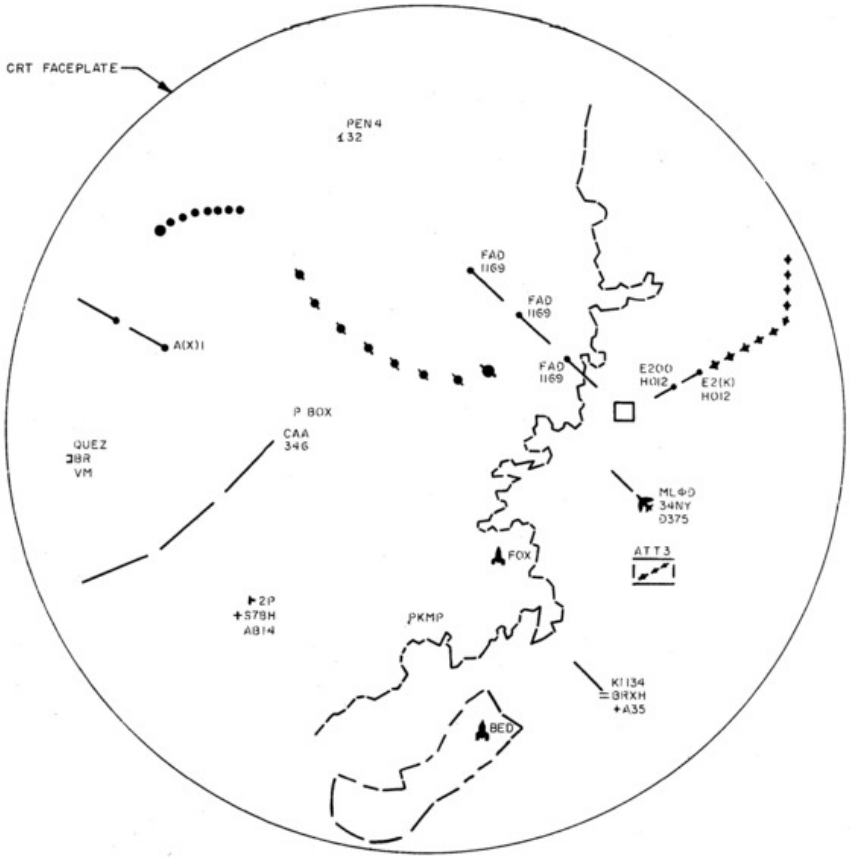


l'AN/FSQ-7

- Il più grande (un primato facile)
  - 250 t (forse 226 Mg)
  - A valvole (60k ca)
  - 3 MegaWatt

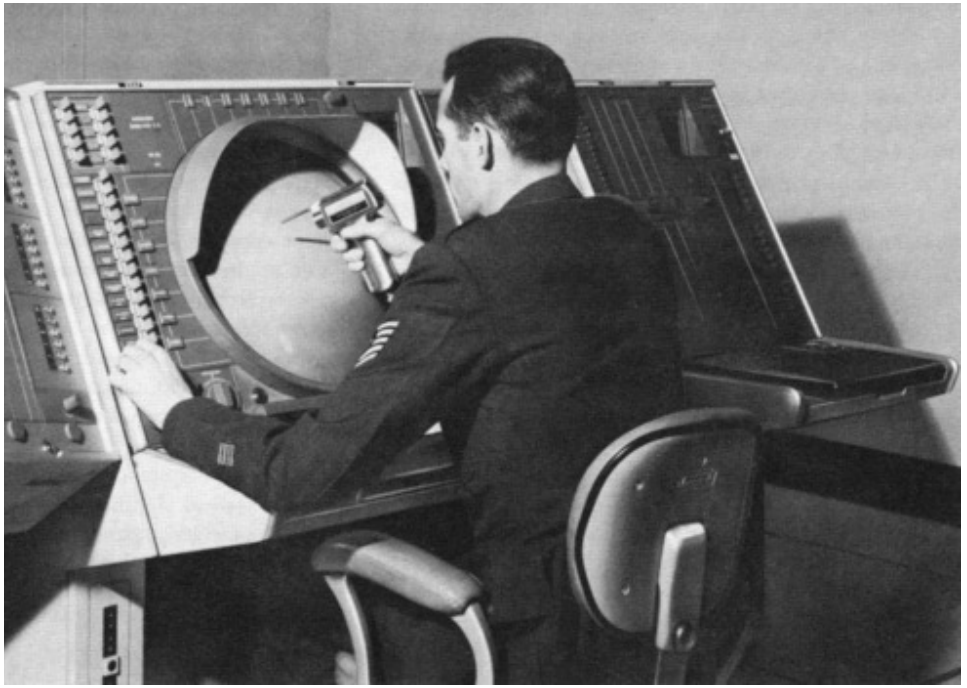
- Una star
  - Westworld, 1973
  - Sleeper, 1973
  - Wargames, 1983
  - Independence Day, 1996
  - Lost S2, 2005

la postazione di lavoro



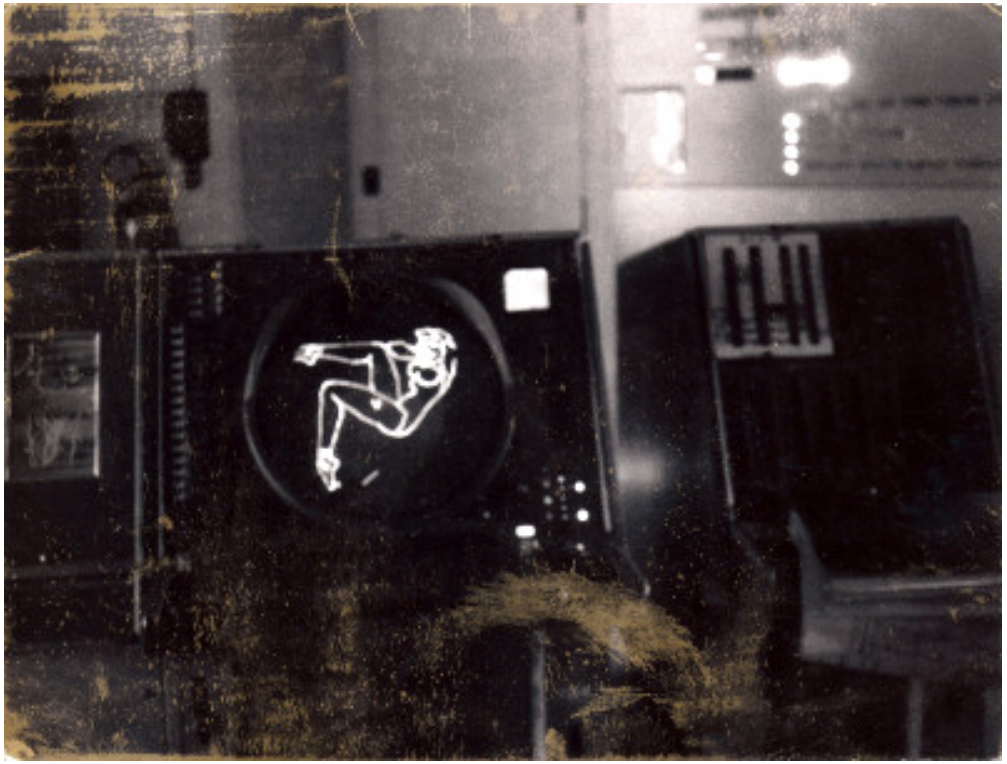
NOTE:
SYMBOLS IN RD MESSAGES WHICH APPEAR LARGER THAN NORMAL ARE SHOWN IN THIS MANNER TO INDICATE THAT THEY ARE DISPLAYED BRIGHTLY.

Figure 4—1. Typical Situation Display



BY NC ND

grafica in caserma



dalle valvole ai transistor...

- Bell Labs, 1947
  - J. Bardeen
  - W.B. Shockley
  - W.H. Brattain
  - Nobel nel 1956
- Texas Inst., 1954
  - G.K. Teal
  - Prima germanio
  - Poi silicio

... dai transistor ai chip...

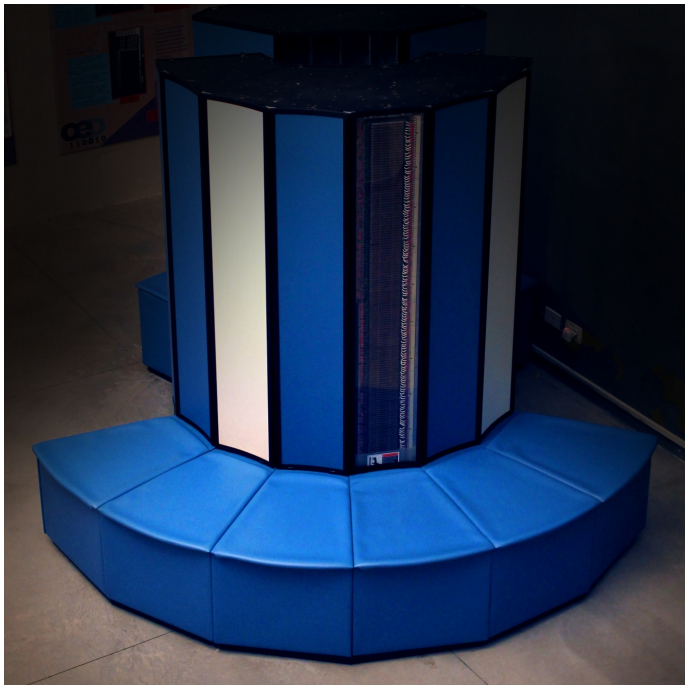
- Velocemente...
  - 1948, il transistor ai Bell Labs
  - 1953, Manchester Experimental Transistor Computer
  - 1955, Harvell CADET, ancora UK
  - 1955, IBM 604, prototipo
  - 1956, MIT TX-0
  - 1957, IBM 608, commerciale
  - 1957, Philco TransAC, commerciale
  - 1957, Traitorous Eight & Fairchild Semiconductor
  - 1958, Mailüfterl, Vienna
  - 1958, Jack Kilby, circuito integrato

... ai microprocessori

- Ancora più velocemente...
  - 1962, Apollo Guidance Computer, MIT & Raytheon
  - 1971, TI SN74181, ALU su singolo chip
  - 1971, Kenbak-1, CPU su più TTL
  - 1971, Intel 4004, Faggin-Hoff-Mazor, Shima (Busicom)
  - 1974, MITS Altair 8800, su Intel 8080
  - 1976, Processor Technology Corp. SOL 20, su 8080
  - 1977, Apple][, su MOS Technology 6502
  - 1980, Commodore VIC-20, sempre su 6502
  - 1981, IBM PC, su Intel 8088
  - 1984, Apple Macintosh, su Motorola 68000

classi di calcolatori

- Personal, mini, mainframe...
- ... e supercalcolatori
  - Macchine progettate per elevate prestazioni
  - Soluzioni specializzate, architettura, raffreddamento...
- Un nome per tutti: Cray
  - 1965, CDC 6600, “fast system” 1MFlops, primo fino al ’69
  - 1975, Cray 1, 80 MFlops
  - 1982, Cray X-MP, 800 MFlops



riferimenti

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