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10/22/2007

Economics of the Internet

EE/W1 (No.2E)

E. History of Computers

1. "Computers" before computer

a. abacus

electric computers (with motors, relays)

IBM's accounting machine (used to process US Census data)

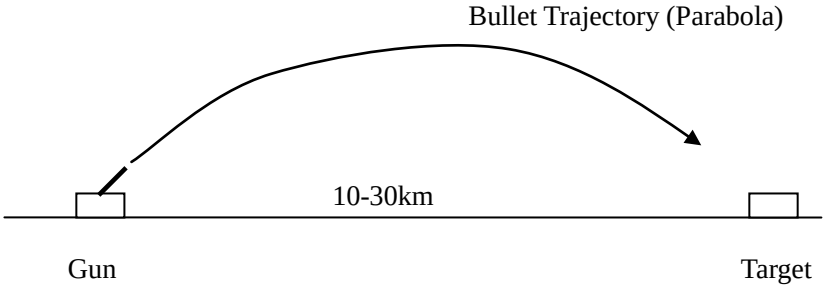
b. the first ELECTRONIC computer (ENIAC)

(1) proposed by John von Neumann (US)

constructed during the World War

to be used for calculating the bullet trajectory of a gunshot

US government supplied a large amount of fund for this



(2) created by J.W. Mauchly and J.P. Eckert of University of Pennsylvania

with 20,000 vacuum tubes

total weight 30 tons, length 30 meters

ENIAC was able to calculate the trajectory, which takes 7 hours by humans, in only 3 seconds

however, ENIAC did not have a software program, it has to be wired for each computing task

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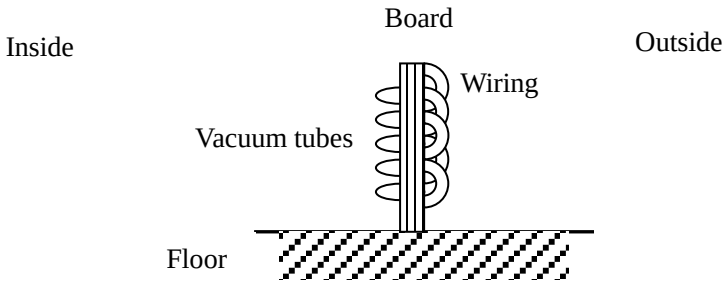

c. Mainframe computers by IBM and others

(1) In 1959, Remington-Rand Corporation constructed the first commercial computer (UNIVAC-1)
with machine language, assembler languages

(2) 1960-70s, transistors used
monopoly by IBM
used for specific purposes such as banking, social-insurance management, aviation control, record keeping for university students

(3) IBM 360 (the third-generation computer)
TSS became available
it was the first large-size mainframe computer

d. Personal computers (1980s-present)

small scale, low-priced computers for personal use
LSI (collection of a large number of CPUs) was used
desk-top or lap-top style
low price; 50,000-40,000 Japanese Yen
used widely at homes and in offices

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F. History of the Internet

1. Networks before the Internet

a. The beginning：TSS（1960s～1980s）

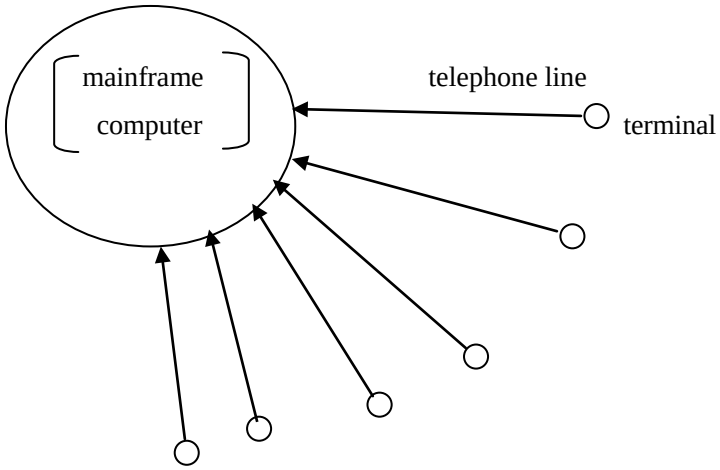
(1) “star-shaped” network with main framers

(2) computer communications

＜JR ticket counters、airline reservation systems＞

＜bank ATMs ＞

TSS（time-sharing system）



b. Personal computer communications(1970s～2000)

network with telephone lines

＜Compuserve（US）＞

＜Nifty-service（Japan）＞

absorbed later into the Internet

c. Other networks

defeated by the Internet

(1) networks with proprietary specifications of computer producers

～1990

＜IBM, FACOM, NEC＞

(2) distributed networks

comprised of mainframers, workstations, PC’s

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＜Netware（US: Novell）＞

＜BitNet（US: IBM）＞

＜N1 Net（Japan, inter-university network）＞

2. ARPANET（1960s）

a. The beginning of packet transmission

(1) J. C. R. Licklider：Galactic Network（1962）

(2) L. Kleinrock：packet transmissions（1961、1964）

b. US Department Defense

DARPA（Advanced Research Projects Administration, U.S. Department of Defense,
APANET construction started（1967）

US-Soviet confrontation (the cold war)

military networks

demand for a flexible network

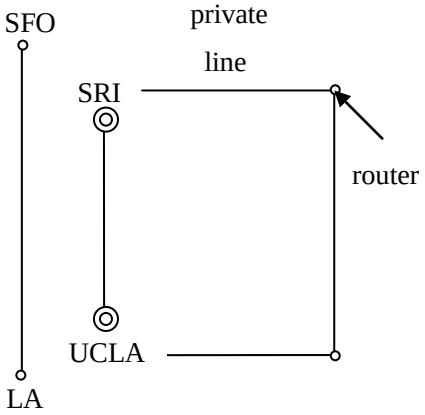
which can survive and function even if destructed in part

↓

a distributed network with packet transmission

（US）

California State



An Experiment with 4 Routers（1969）

3. Academic networks (1970s-1980s)

a. 1970s（US）

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(1) Expansion of the ARPANET

－ARPANET is used in universities

as a network for research

increase in the number of subscribing universities

↳ the origin of the Internet

(2) E-mails started（1972）

The main application of the Internet for 20 years until the emergence of WWW

b. The emergence of the Internet concept

(1) R. Kahn: open-network architecture（1972）

networks interconnected on an equal basis

TCP/IP specifications

(2) The Internet principles

an open system

4 principles：each member-network functions independently

no operation center (a distributed network)

uses gateway routers (no flow memory)

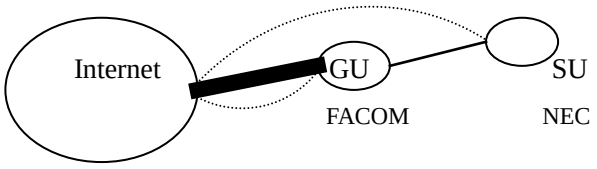
best-effort transmission

(possible congestion and loss of packets)

other principles：uses a global addressing system

data flows controlled by routers

users may log-in via OS on PC



TCP/IP system:

V. Cerf：TCP/IP system

“Father of the Internet”

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