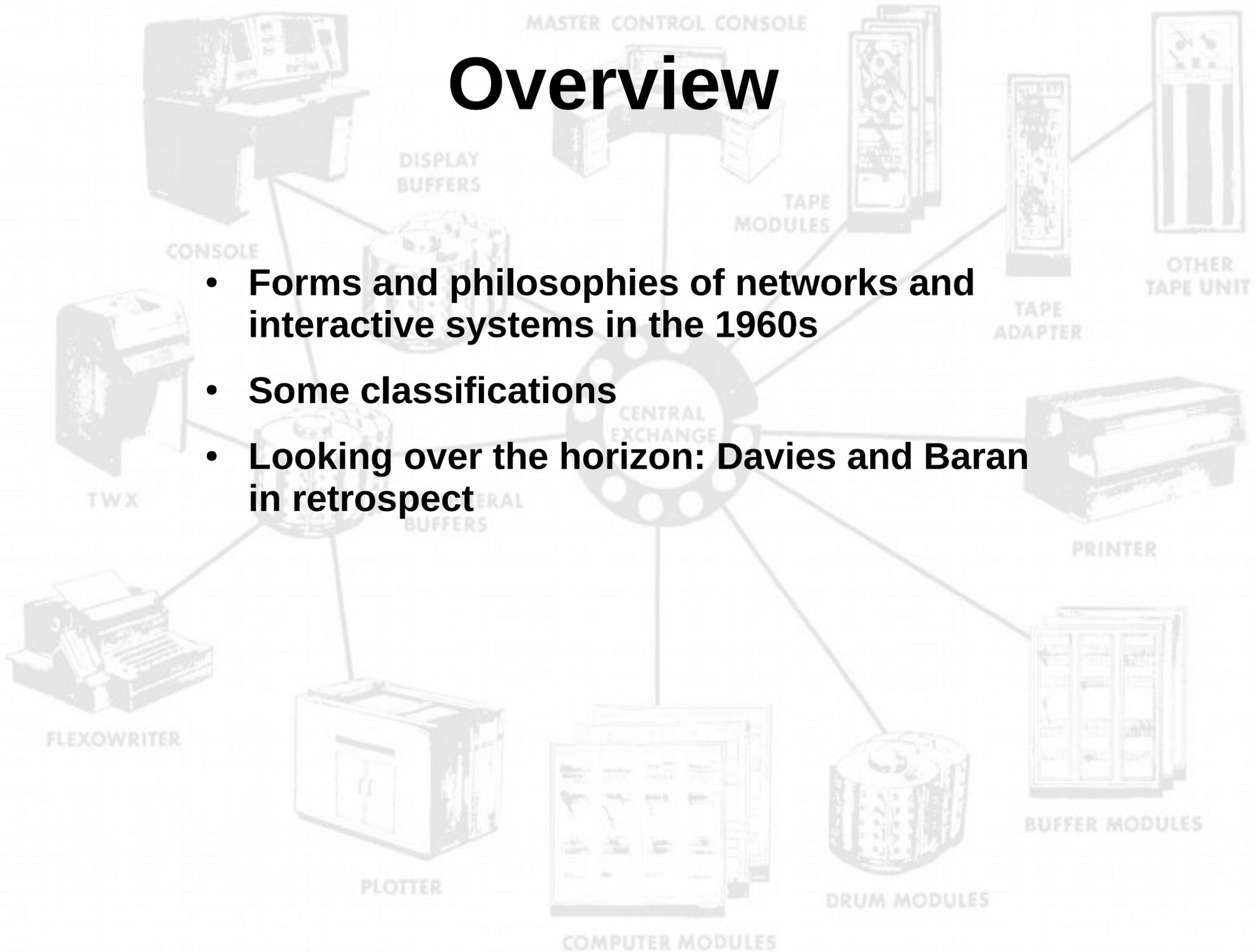


**Timesharing,
Multiprogramming,
Communications and Cie.
Different philosophies and
technologies of interaction
around 1960.**

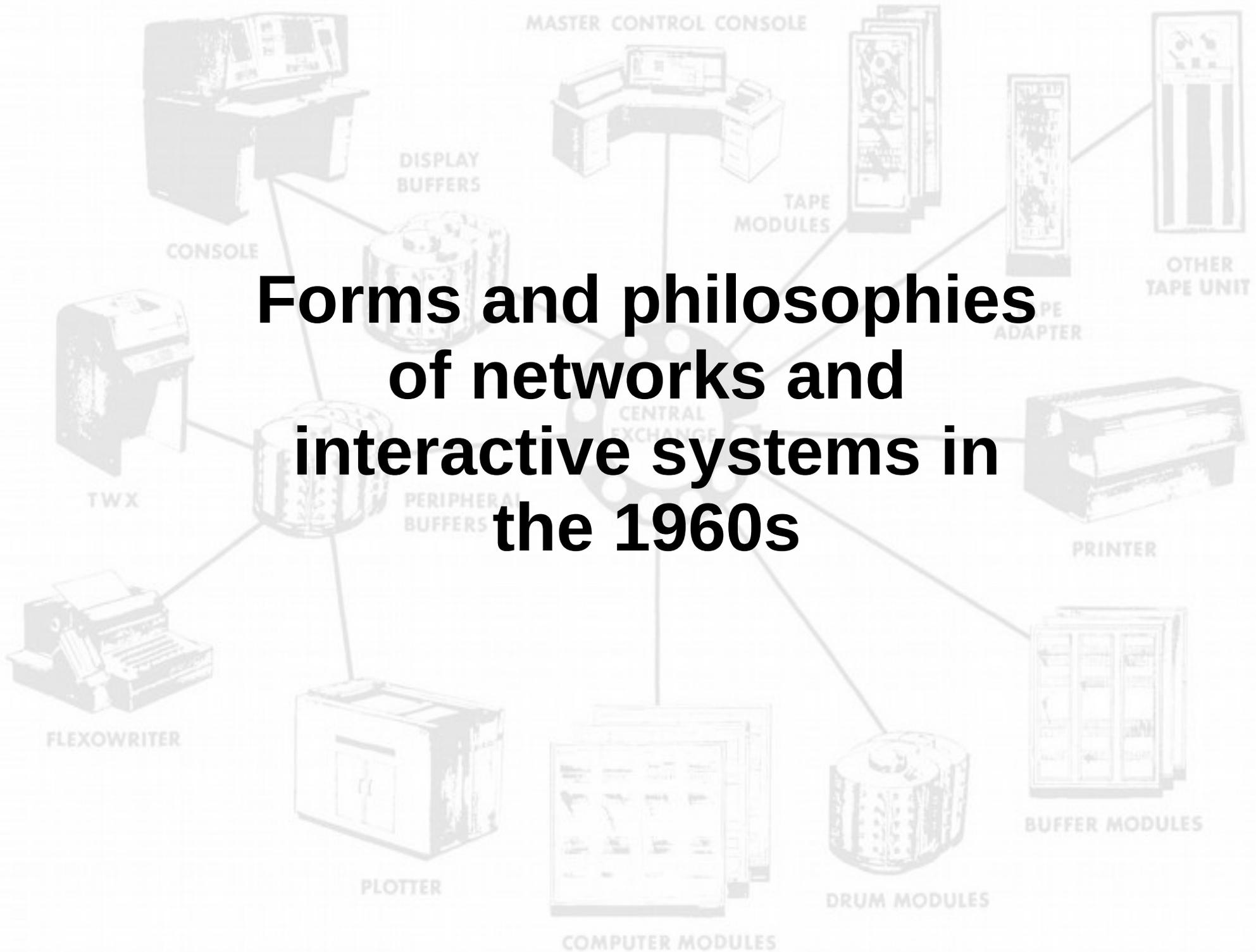
Maarten Bullynck
Université Paris 8
Workshop Réseaux, 24 avril 2019, Lille

Overview

- Forms and philosophies of networks and interactive systems in the 1960s
- Some classifications
- Looking over the horizon: Davies and Baran in retrospect



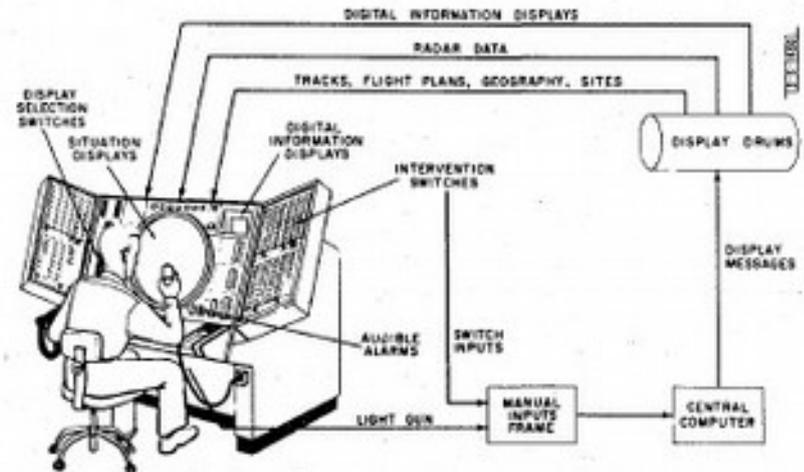
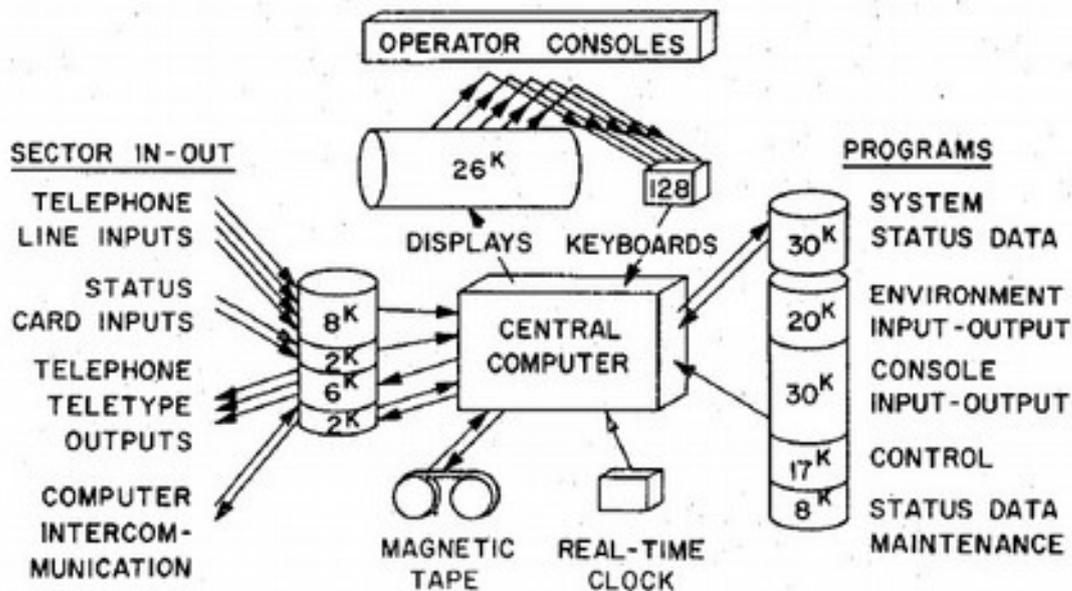
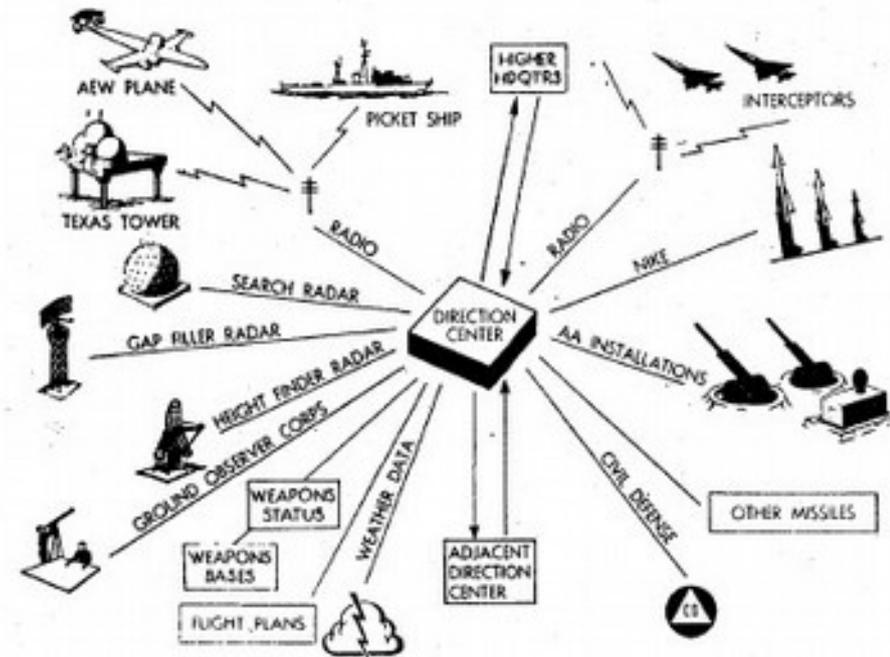
Forms and philosophies of networks and interactive systems in the 1960s



Command & Control

SAGE

- Interactive system
- Information system
- Realtime system



Command & Control

MASTER CONTROL CONSOLE

DISPLAY

CONSOLE

TWX

FLEXOWRITER

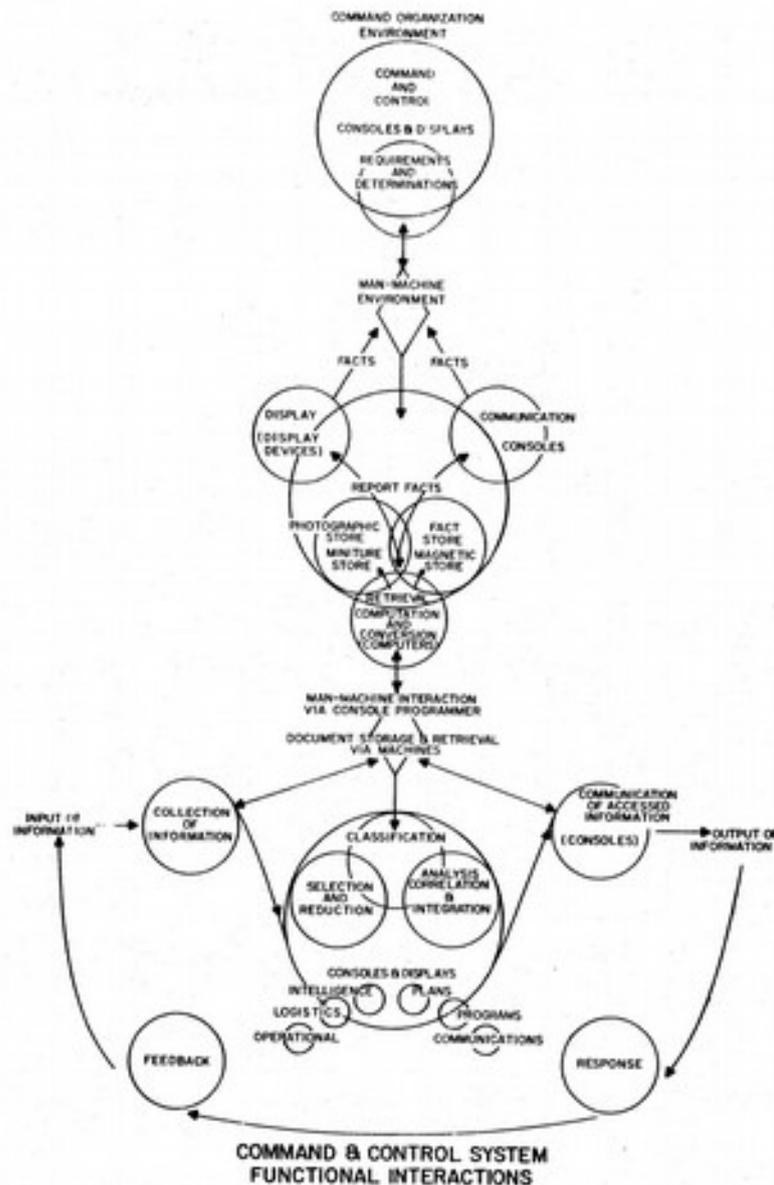
OTHER TAPE UNIT

TAPE ADAPTER

PRINTER

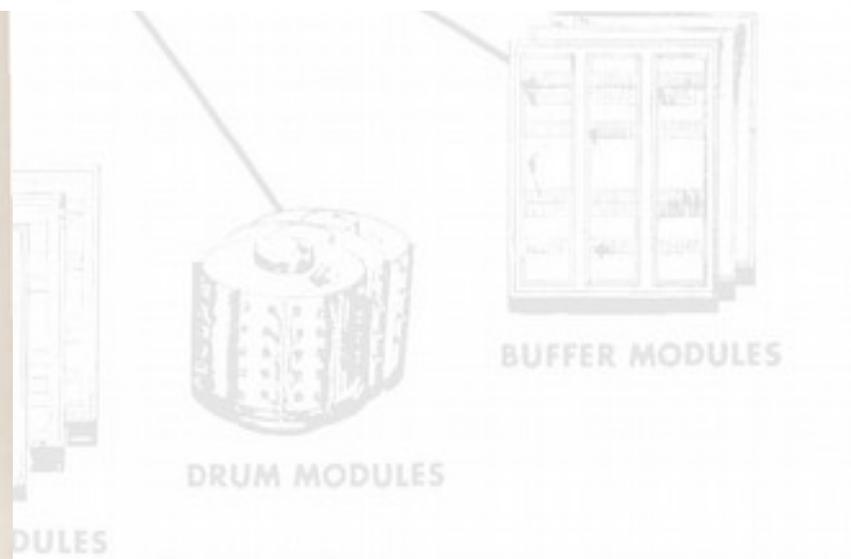
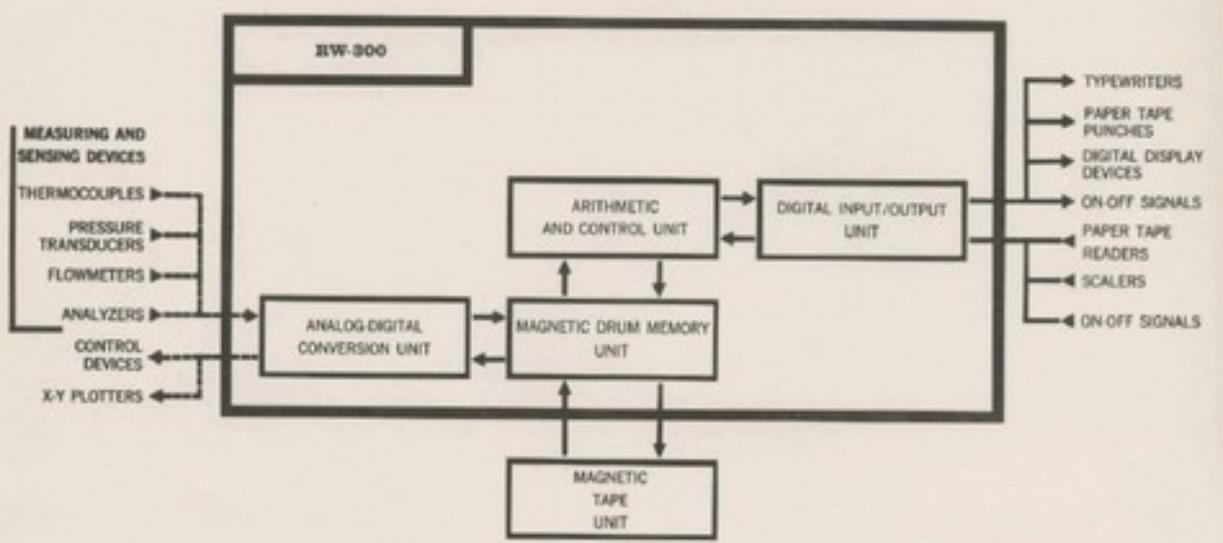
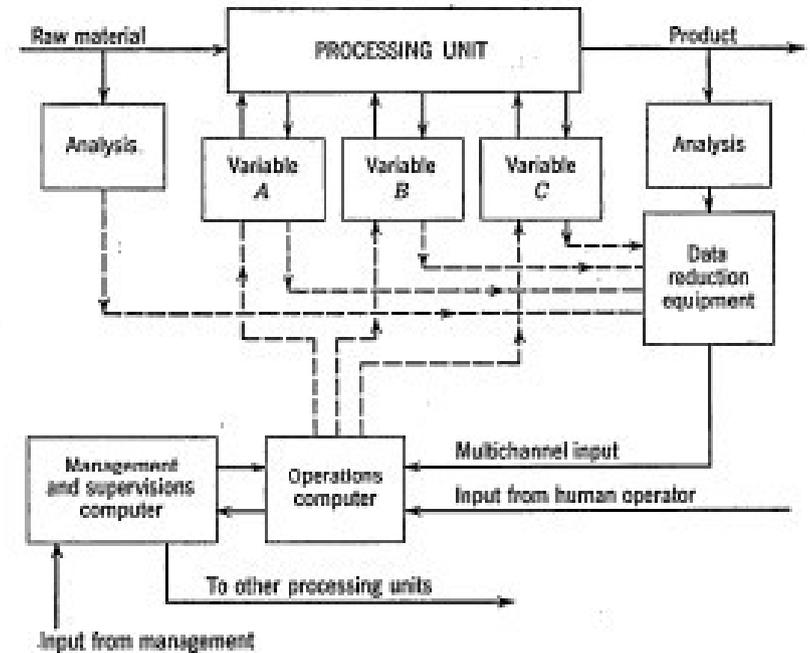
BUFFER MODULES

MODULES



Realtime systems

- Digital-Analog coupling
- Process control



Dataphone, Teleprocessing...

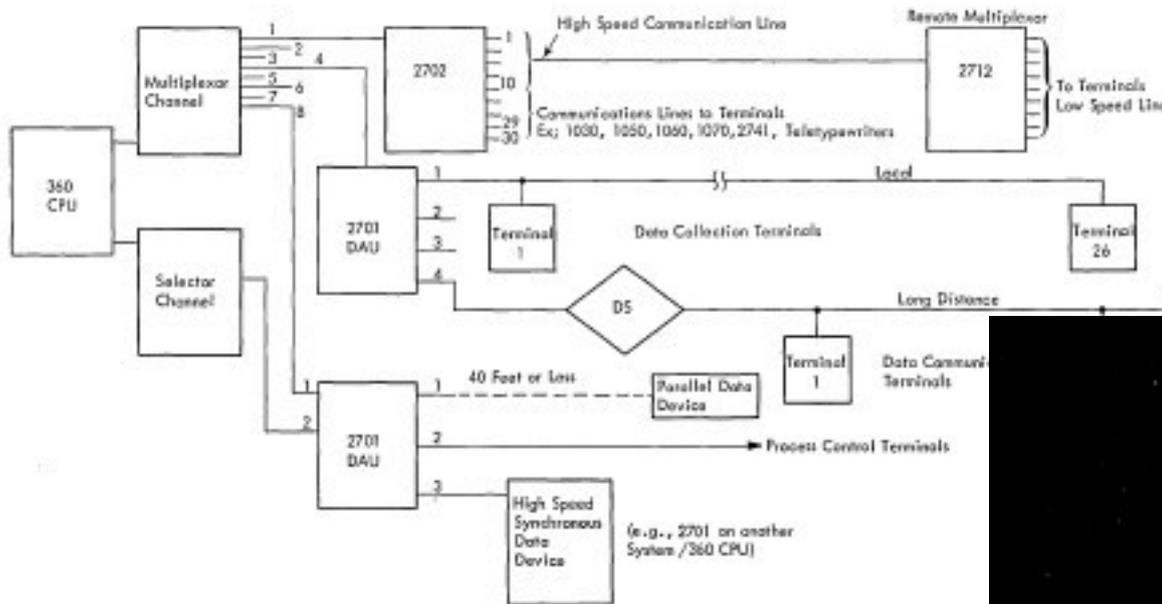


FIGURE 4. SYSTEM/360 TELEPROCESSING



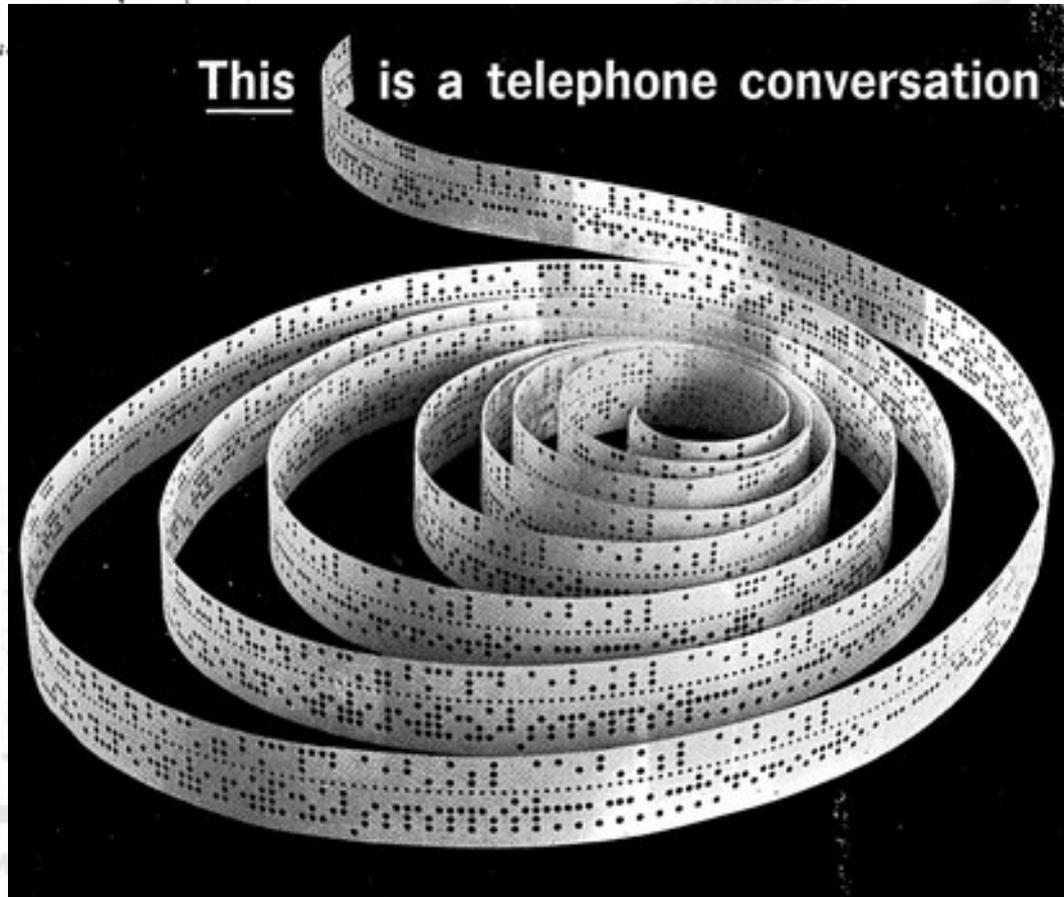
FLEXOWRITER



PLOTTER



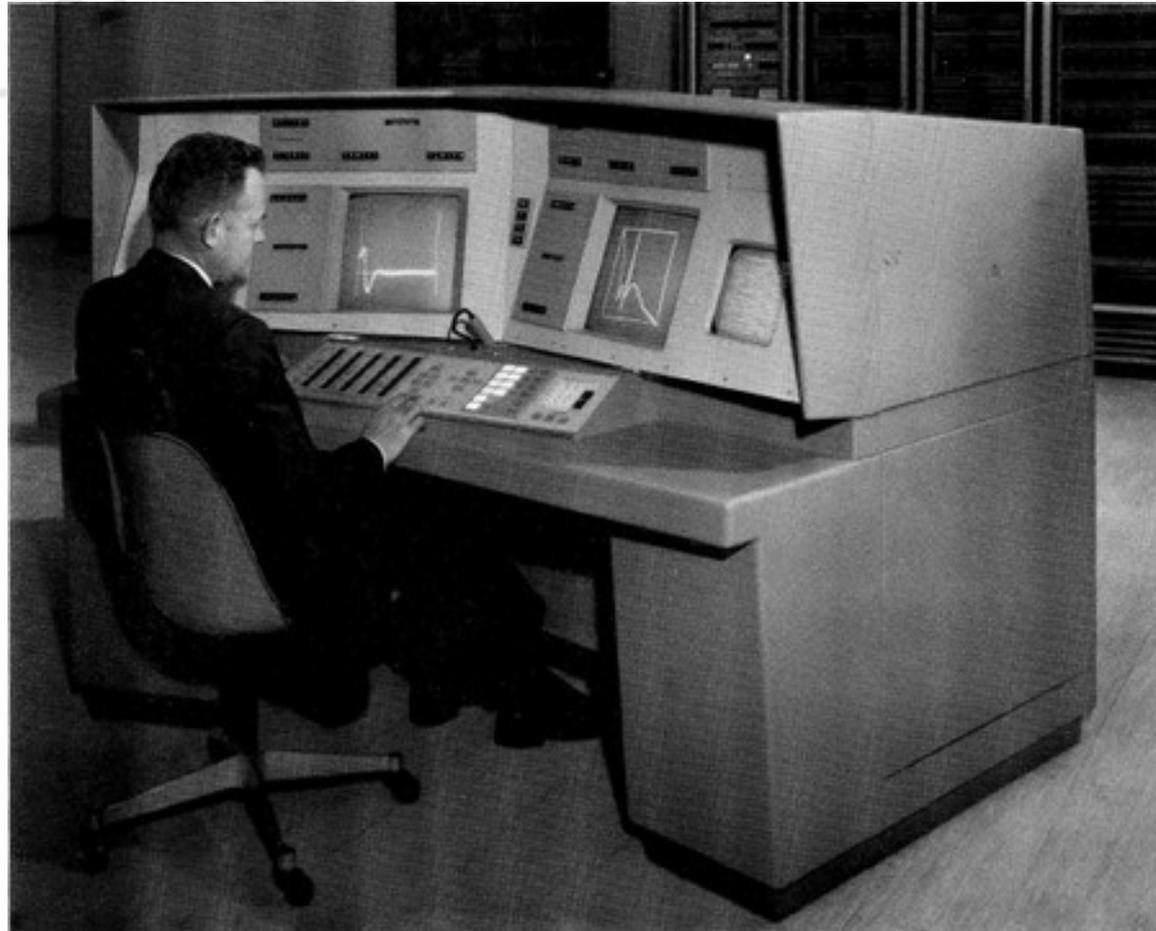
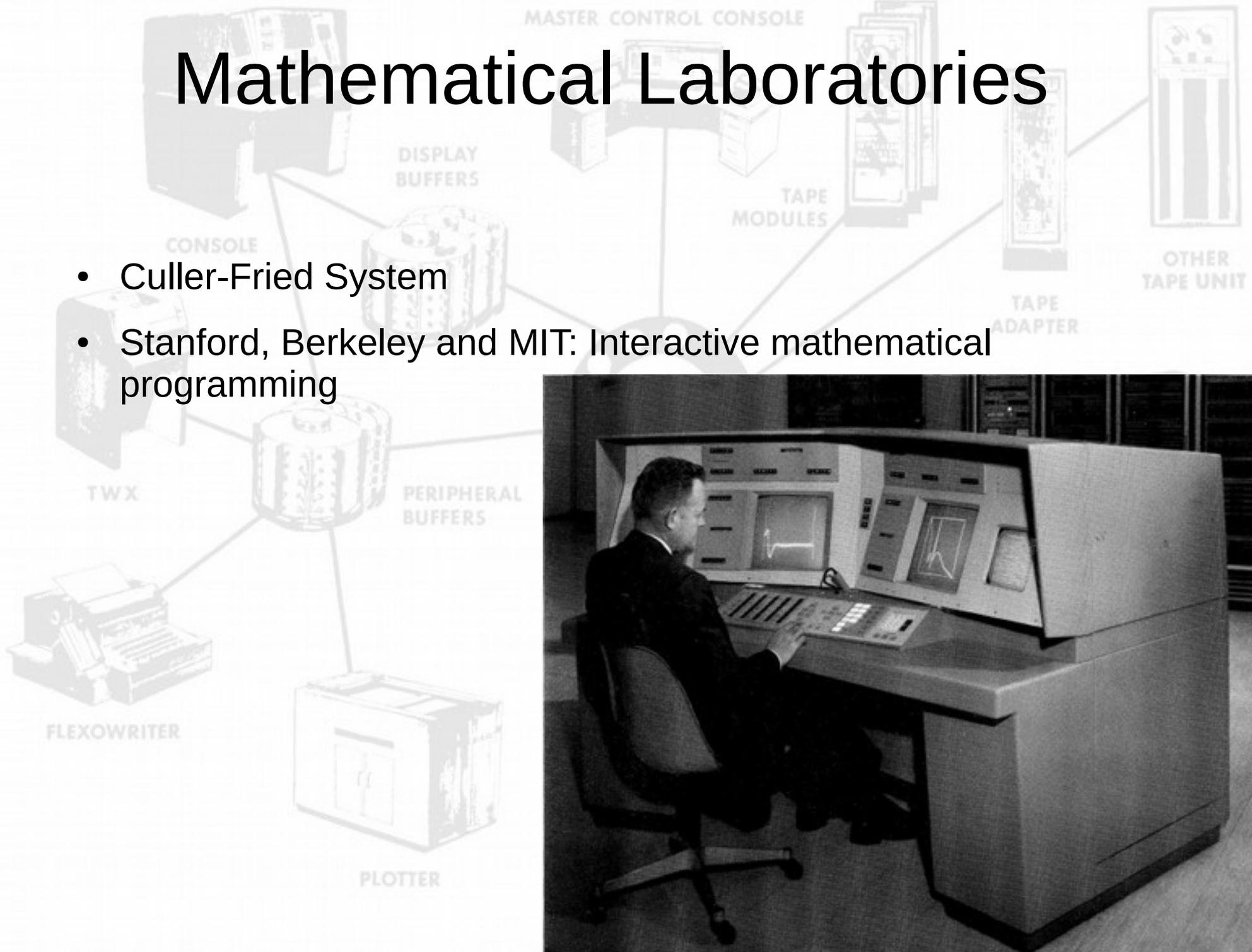
CONSOLE



This is a telephone conversation

Mathematical Laboratories

- Culler-Fried System
- Stanford, Berkeley and MIT: Interactive mathematical programming



The two “brands” of timesharing

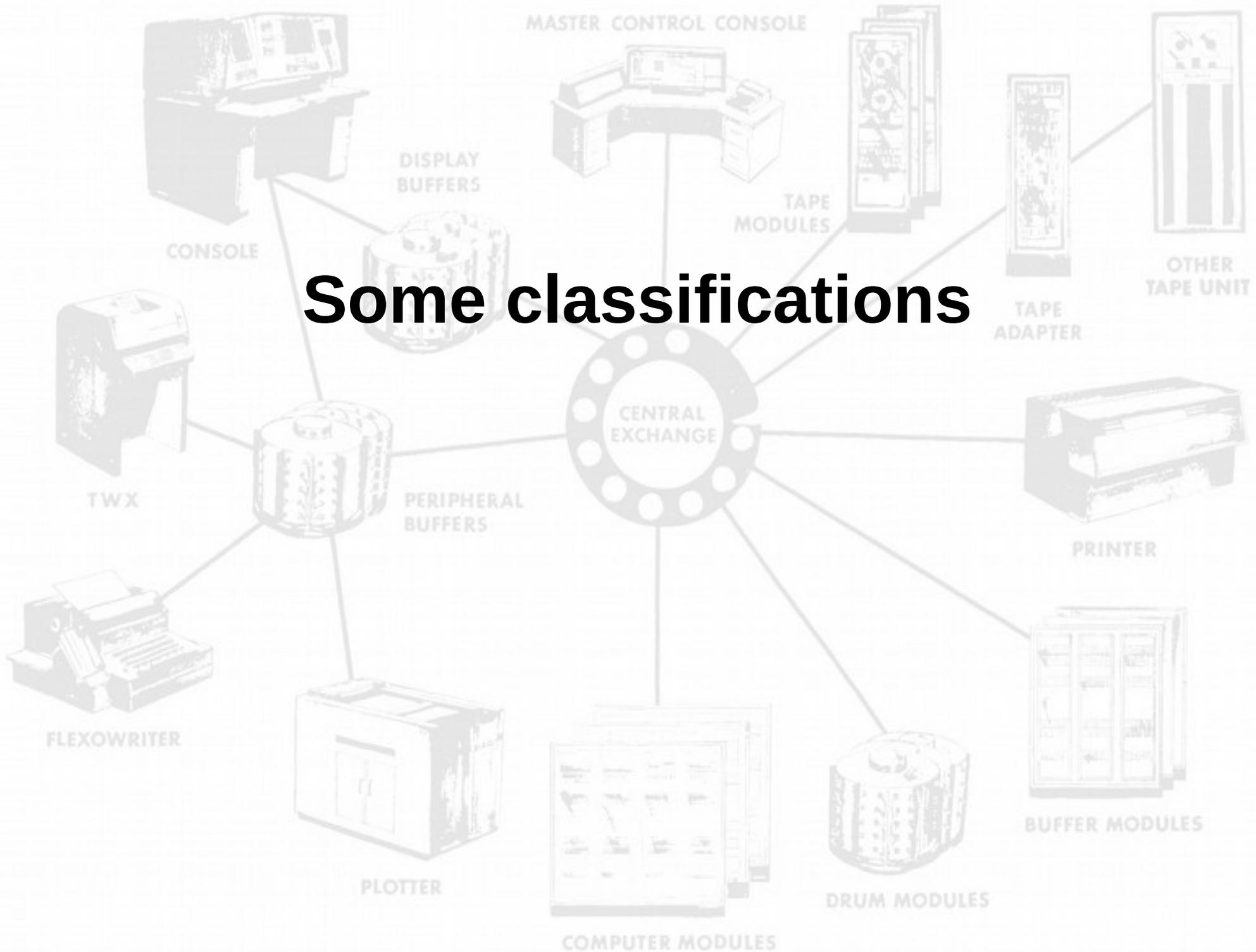
- Bemer 1957 or Bauer 1958: The “**computer utility**”

“each large metropolitan area would have one or more of these super computers [that] would handle a number of problems concurrently. Organizations would have input-output equipment installed on their own premises and would buy time on the computer much the same way that the average household buys power and water from utility companies.”

- Strachey 1959 or McCarthy 1959: The **programmer's timesharing**

“A programmer could substantially increase his own efficiency, if he and his program had the means of communicating with other in languages best suited to both, while the program was being tested. The amount of machine time that is in general wasted while a programmer sits at a console and makes his decisions usually rules this method out as an efficient means of program testing. This difficulty may be overcome through a system of “time sharing” the test with either a production run or other programs under test, as long as the programmers and programs are prevented from damaging interaction, and each is able to treat his program as if it were the only one in the machine, by means of an input-output device (such as a typewriter) which could allow a “conversation” between programmer and machine.”

Some classifications



Classification from the side of IBM

“Remote computing has been around as long as computers themselves. More recently, interest has revived in providing remote users with convenient, economical access to a large central computer. ... Several batch-oriented systems have been implemented. The techniques of time-sharing a large or small system have been described, as have the attendant advantages of man-machine interaction for symbolic mathematics and program testing. ... The management, systems analysis, program testing, and documentation of specialized real-time systems have also been emphasized, but much less attention has been given to the design of general-purpose online system. This paper reviews some general system requirements and applications criteria leading to basic design objectives and constraints for remote-computing systems.” (Dunn, Morrissey, 1964)

Classification from the side of Bauer (TRW, Informatics)

“There exists a canonical structure for the programming systems of on-line systems which consists of five major pieces: console and communication programs, executives, utilities, operating programs and data base.” (Bauer 1965)

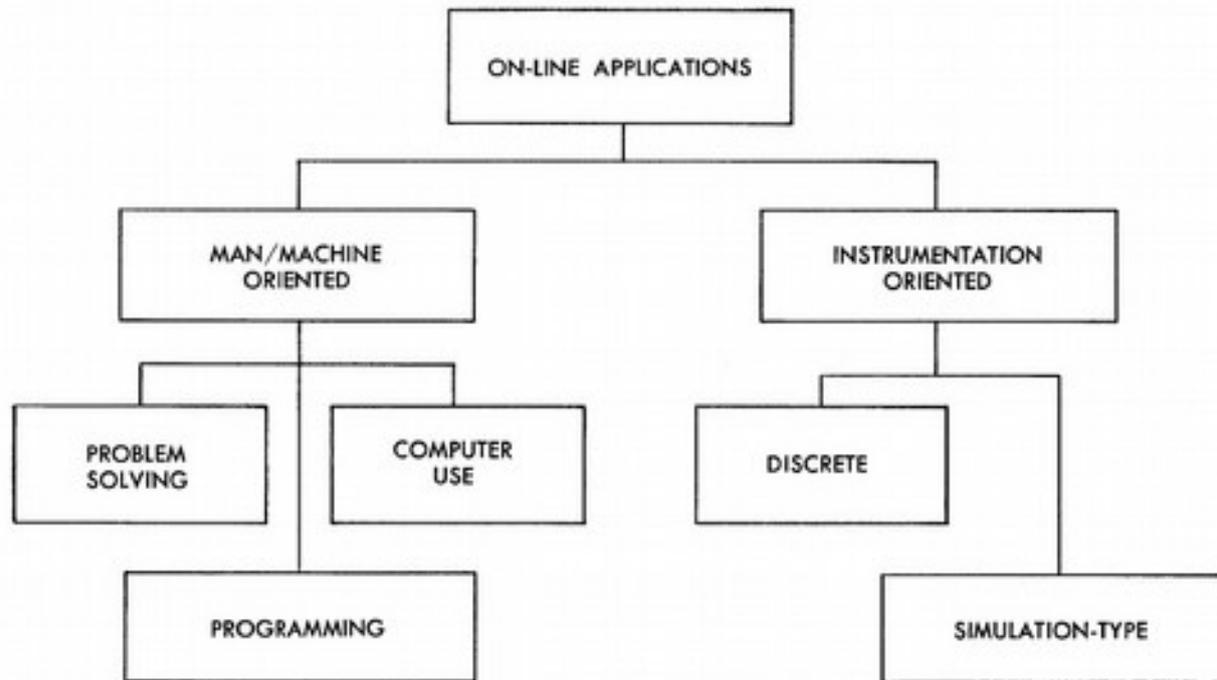


FIGURE 2

TWO MAJOR AREAS OF ON-LINE COMPUTING

Classification from the side of Bell (DEC)

“The discussion emphasizes the general purpose time-sharing, since special purpose time-sharing, “real time”, and “on line systems” are a subset. ... After the basic system is specified, it is the philosophy of the author that the system should be formed in a time-shared environment (including the construction of the Operating System Software).... The underlying design criteria should be: flexibility, modularity, simplicity of module intercommunication, and open endedness.

The basic objectives of time-sharing are to increase both user and overall computer system productivity. The present general computational systems are an extension of special, shared, multiprogrammed systems centered around special applications (e.g., process control, command and control, information inquiry, etc.). As such, Time Sharing is another technique which makes the computer a more general tool.” (Bell 1967)

Classification from the side of USAF

“The surveyed systems have been grouped into six major categories: (1) general purpose programming and executives systems [CL-II, AOSP, DODDAC, NECPA, OASIS, and INTIPS]; (2) functional systems [SKETCHPAD, BASEBALL, DEACON, JOSS, and Culler-Fried.]; (3) man-machine interface systems [STRESS, COGO]; (4) special-purpose programming systems; (5) time-sharing systems [project MAC, SDS]; (6) generalized data management systems. [ADAM, LUCID]

....

Given that the features in the above list have proved to be valuable, individually and in various combinations, the approach of the designer of "next generation" systems might profitably be the following: rather than concentrating on a specific application, and building up from scratch a computer system to meet those requirements, he should start by designing a hardware-software sub-system which provides, or facilitates the provision of all (or a large subset) of these desirable modes of operation, programming environments, etc.” (USAF 1965)

Looking over the horizon: Davies and Baran in retrospect



Baran in retrospect

“New digital computer techniques using redundancy make cheap unreliable links potentially usable. Some sort of a switched network compatible with these links appears appropriate to meet this new upcoming demand for digital service. [...] Such a system should economically permit switching of very short blocks of data from a large number of users simultaneously with intermittent large volumes among smaller set of points. Considering the size of the market there appears to be an incommensurately small amount of thinking about a national data plant designed primarily for data. Is it time now to start thinking about a new and possibly non-existent public utility, a common user digital data communication plant designed specifically for the transmission of digital data among a large set of subscribers?”

(Baran 1962, On distributed communication networks)

MASTER CONTROL CONSOLE

DISPLAY
BUFFERS

TAPE
MODULES

CONSOLE

OTHER
TAPE UNIT

TWX

FLEXOWRITER

PLOTTER

COMPUTER MODULES

DRUM MODULES

BUFFER MODULES

Davies in retrospect

“The significance of the real time use of Computers. [...] (a) Realtime use of computers gives rise to many of the communications requirements which the network will satisfy. This category includes multi-access computers. (b) The methods used in multi-access computers for their internal operation illustrates, by analogy, some of the design features of the proposed communication system. [...]

The great majority of potential commercial computer applications will never be embarked upon with the present inflexible and costly communication systems. They are costly when used for digital data transmission when all the additional equipment and the poor usage of lines is considered, and this is because they were designed for different purposes.”

(Davies 1966, Proposal for a digital communication network)

