

B Betriebssysteme

B1 Betriebssysteme: Einführung und Motivation

(a) wl+Tanenbaum

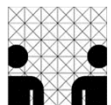
(b) Wolfinger

B2 Prozesse: Scheduling und Betriebsmittelzuteilung

B3 Speicherverwaltung

B4 Dateisysteme

B5 Ein-/Ausgabe

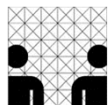


B “Betriebssysteme”

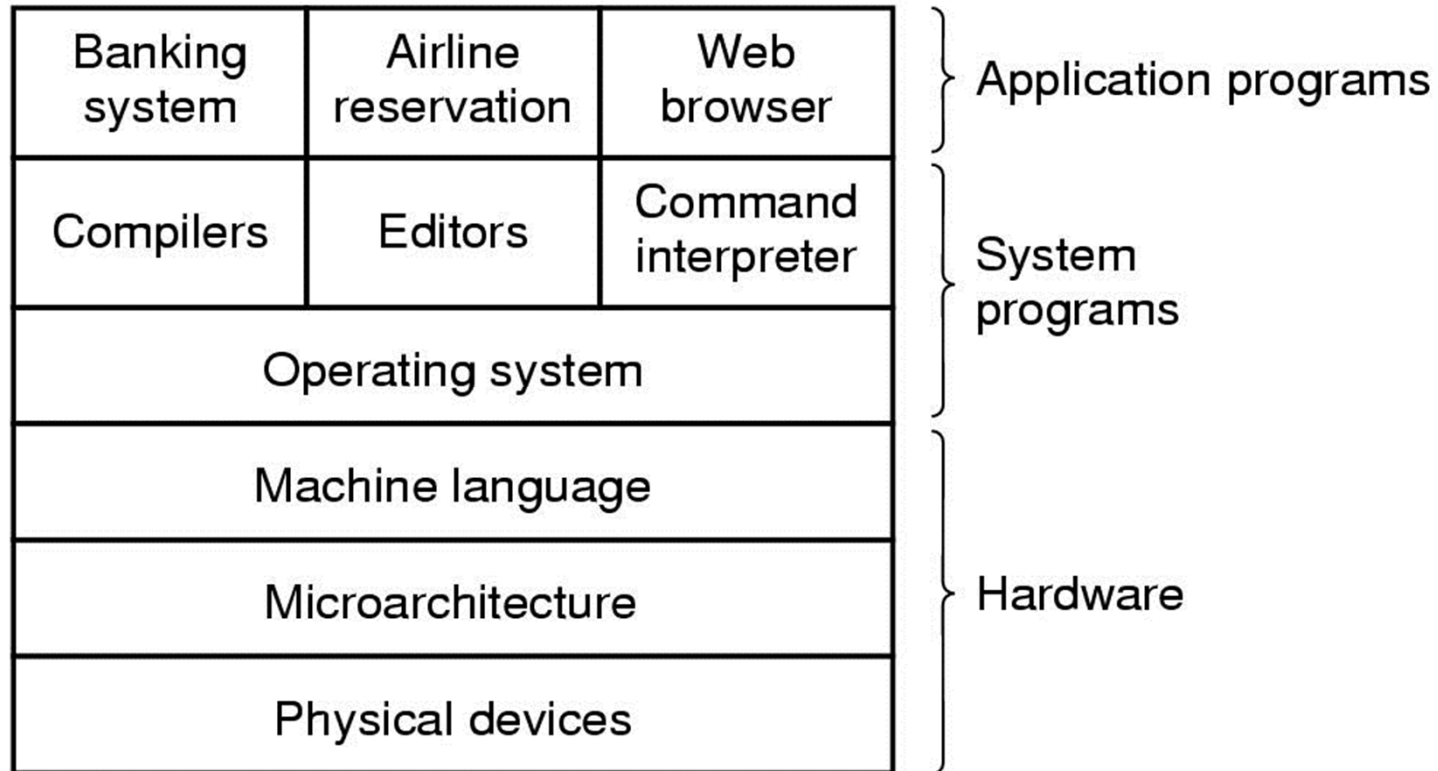
B1: Einführung und Motivation (a)

aus: A. Tanenbaum: “Operating Systems” (Chapter 1)

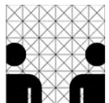
- What is an operating system
- Architekturalternativen (WL)
- History of operating systems
- The operating system zoo
- Computer hardware review
- Operating system concepts
- System calls
- Operating system structure



Introduction

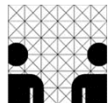


- **A computer system consists of**
 - Application programs
 - System programs
 - Hardware



What is an Operating System

- **It is an extended machine**
 - hides the messy details which must be performed
 - presents user with a virtual machine, easier to use
- **It is a resource manager**
 - each program gets time with the resource
 - each program gets space on the resource



Architektur (verteilter) Systemsoftware

Rechensystem

Banksystem	Flugreservierung	Spiele ...	Anwendungen
Compiler	Editoren ...	Kommandointerpreter	System- programme
Betriebssystem			
Maschinensprache, Mikroprogrammierung			Hard- ware
physikalische Geräte			

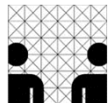
Alternative Sichtweisen eines (verteilten) Betriebssystems...

...als „*erweiterte / virtuelle*“ Maschine

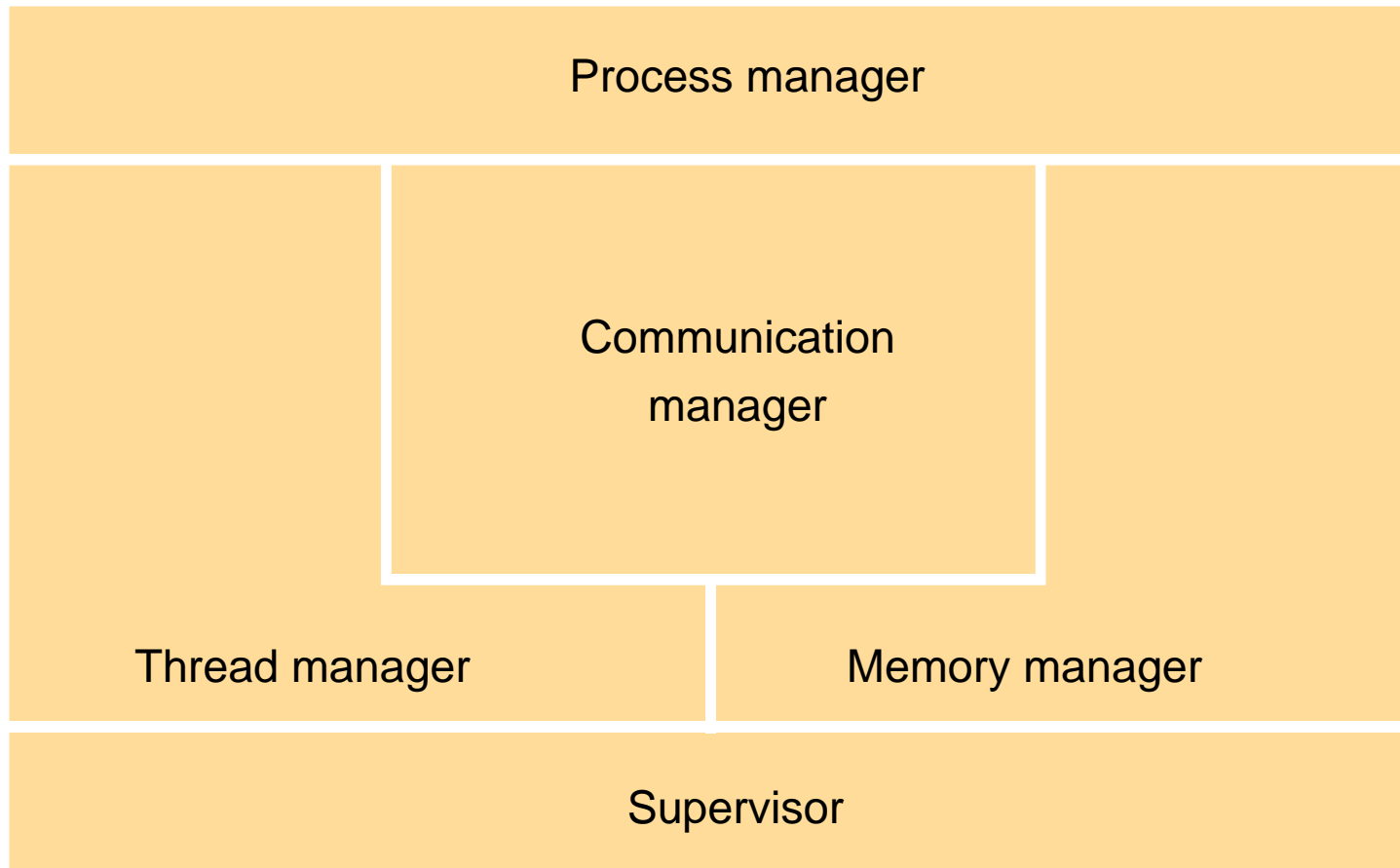
Ziel: zunehmend „komfortable“ Abstraktion von Systemeigenschaften

...als „*Betriebsmittelverwalter*“

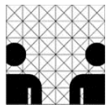
Aufgaben: Allokation / Vermittlung / Verwaltung von Ressourcen –
d.h. (u.a.) von Speichern, Prozessen, Geräten, Netzschnittstellen etc.



Core OS functionality

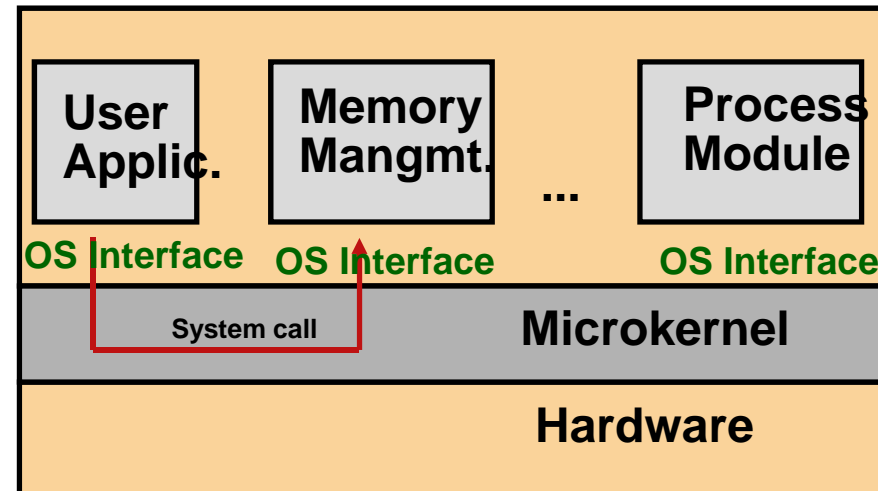


aus: Coulouris/Dollimore/Kindberg: Distributed Systems



Betriebssysteme: Systemalternativen

A) Mono-Prozessor: *Microkernel-Architektur*

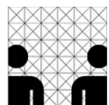


B) Multi-Prozessor:

DOS (Distributed OS): eng gekoppeltes BS für Multi-Prozessoren und homogene Multi-Computer

NOS (Network OS): lose gekoppeltes BS für heterogene Multi-Computer (LAN und WAN)

Middleware: zusätzliche Ebene oberhalb des NOS zur Implementierung allgemeiner Dienste



Alternative Betriebssystem-Architekturen

A) Geschichtetes System

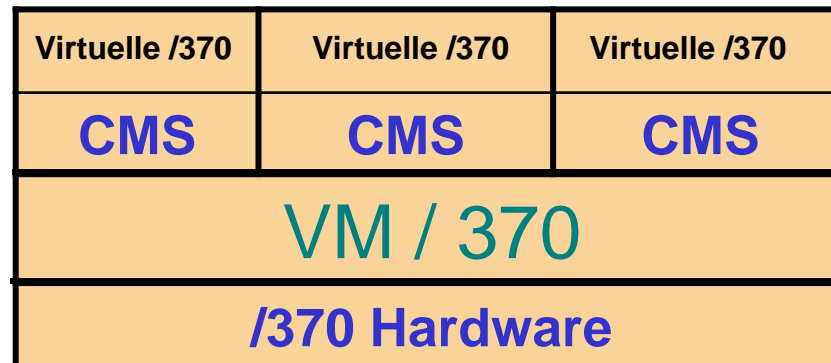
Bsp: THE (Dijkstra 68)

5	Operator
4	Benutzerprogramme
3	Ein-/Ausgabeverwaltung
2	Prozesskommunikation
1	Speicherverwaltung
0	Prozessorvergabe/Multiprogrammierung

B) Virtuelle Maschine

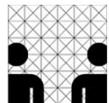
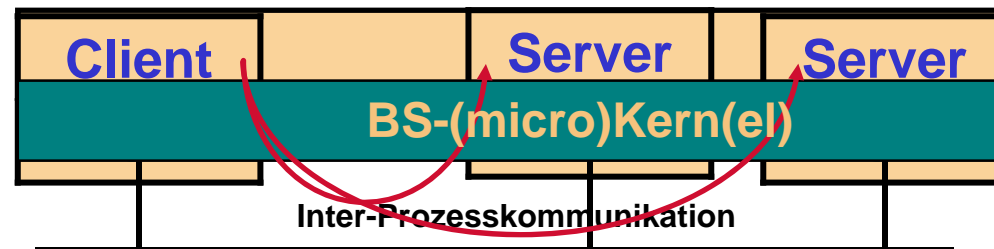
Bsp: IBM /370 mit VMS (70er)

zentral



C) Client/Server-Modell

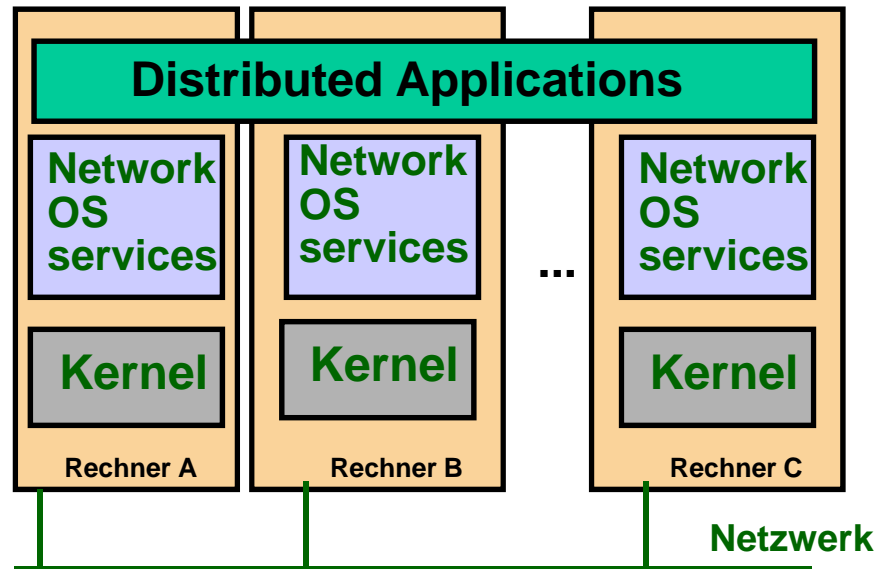
modularer Aufbau,
flexibel, erweiterbar, ...



Verteilte Betriebssystemalternativen (1)

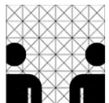
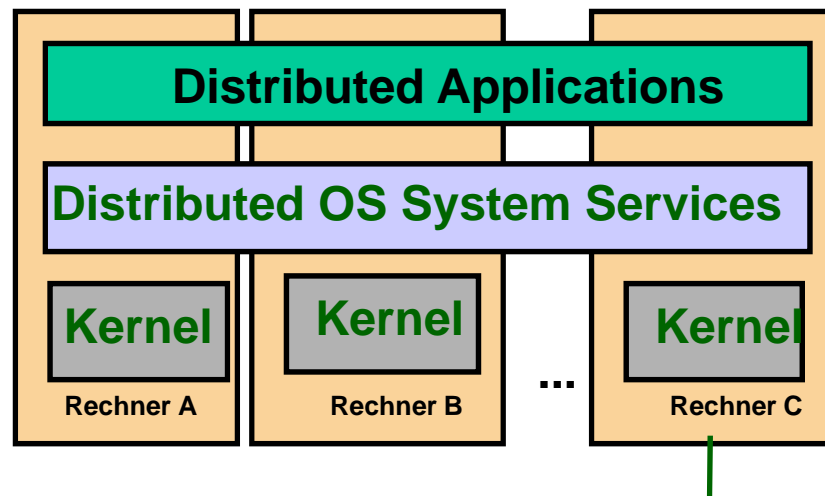
A) Netzwerk-BS:

- + Autonomie
- Transparenz



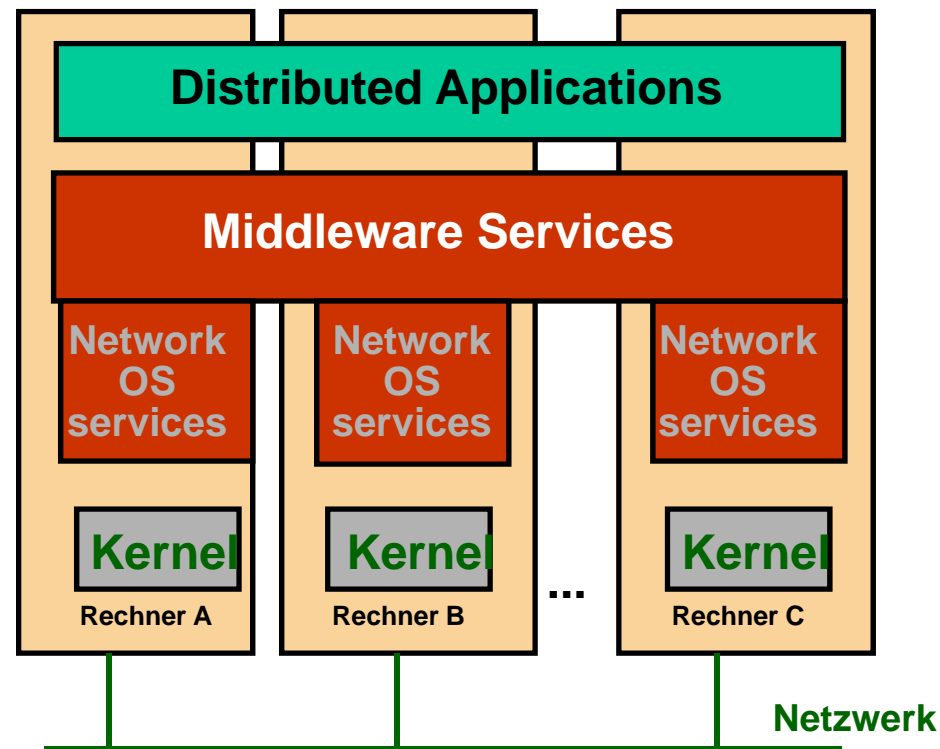
B) Multiprocessor/ Multicomputer / Verteiltes BS:

- + Transparenz
- Autonomie

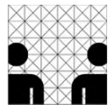


Verteilte Betriebssystemalternativen (2)

C) Middleware-basiertes verteiltes (Betriebs-) System:

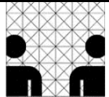


Basis: Client/Server- (Dienste-) Kooperation
auf *Anwendungs-* und *Systemebene*!

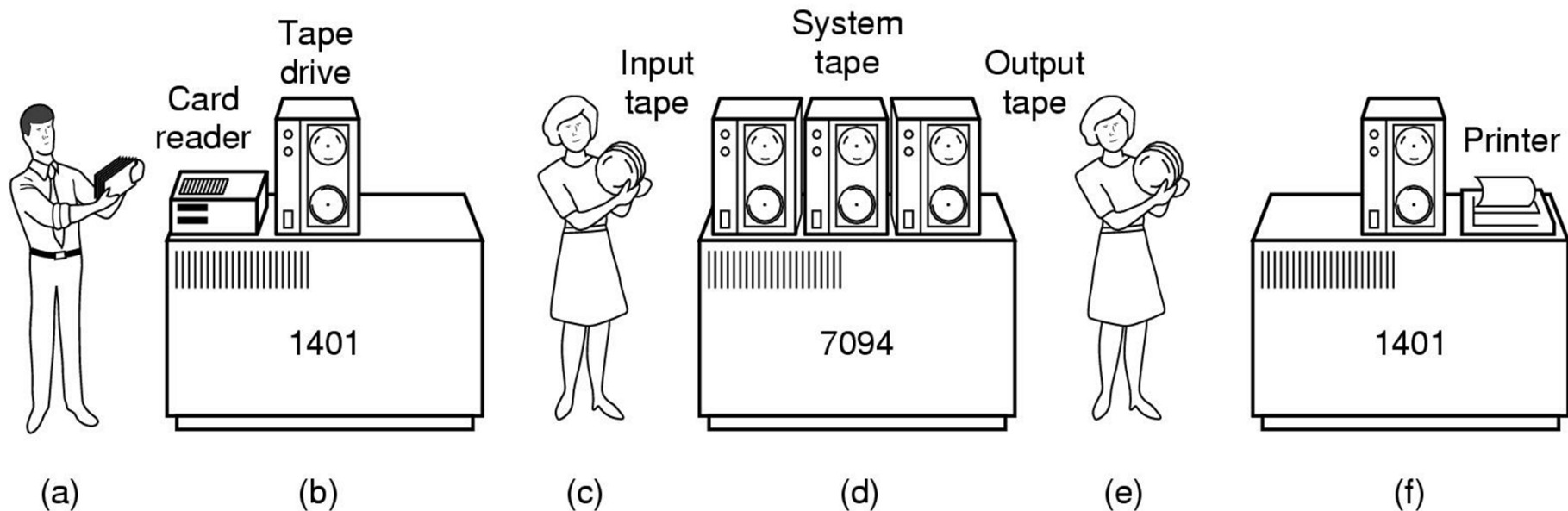


Vergleich der Betriebssystemalternativen

	Distributed OS <i>Multiprocessor</i>	Distributed OS <i>Multicomputer</i>	Network OS	Middleware- based DS
Degree of transparency	Very high	High	Low	High
Same OS on all nodes ?	Yes	Yes	No	No
Number of copies of OS	1	N	N	N
Basis for communication	Shared memory	Messages	Files	Model specific
Ressource management	Global, central	Global, distributed	Per node	Per node
Scalability	No	Moderately	Yes	Varies
Openness	Closed	Closed	Open	Open

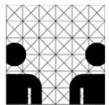


History of Operating Systems (1)



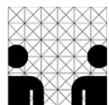
Early batch system

- bring cards to 1401
- read cards to tape
- put tape on 7094 which does computing
- put tape on 1401 which prints output

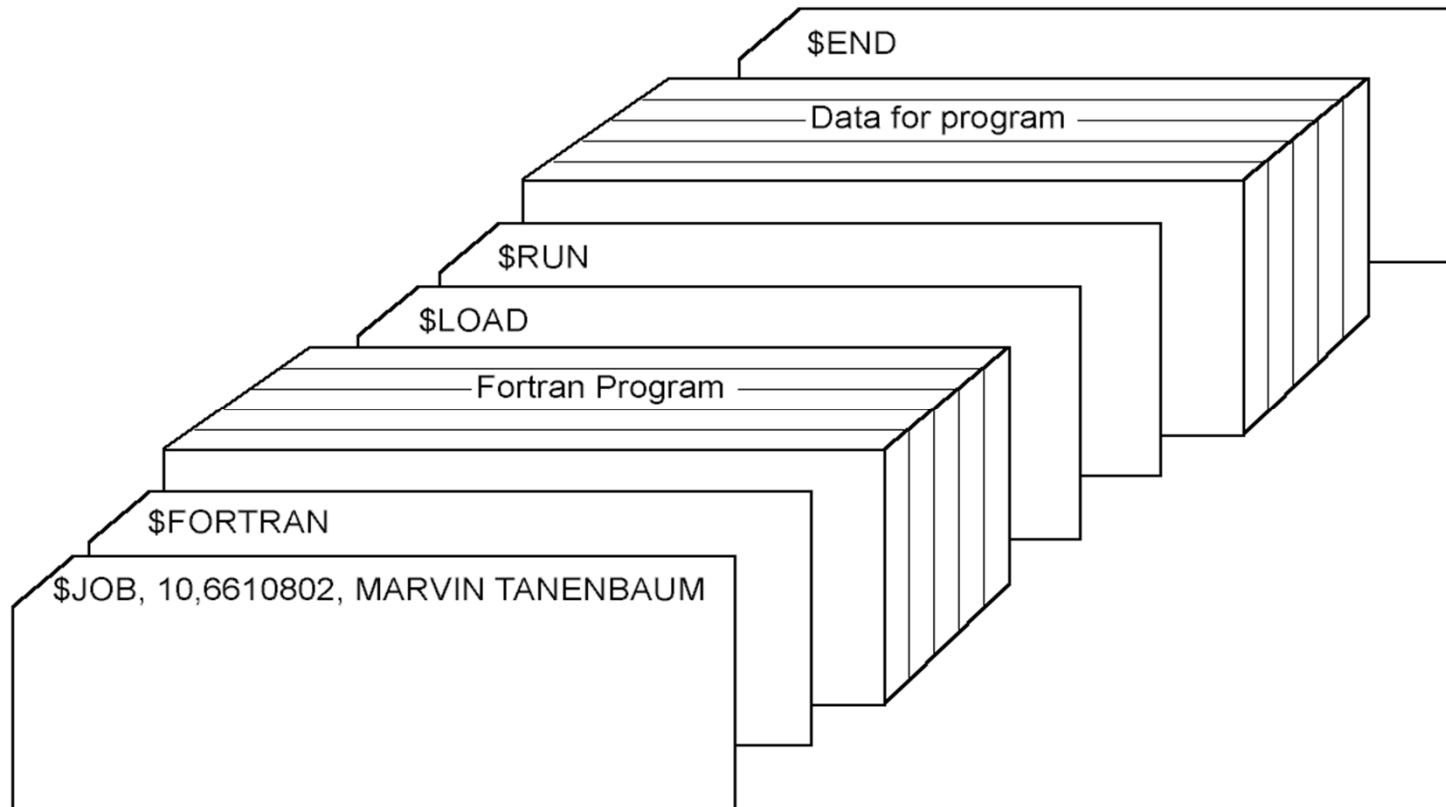


History of Operating Systems (2)

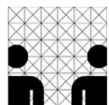
- **First generation 1945 - 1955**
 - vacuum tubes, plug boards
- **Second generation 1955 - 1965**
 - transistors, batch systems
- **Third generation 1965 – 1980**
 - ICs and multiprogramming
- **Fourth generation 1980 – 1995**
 - personal computers
- **Fifth generation 1995 – present**
 - mobile devices



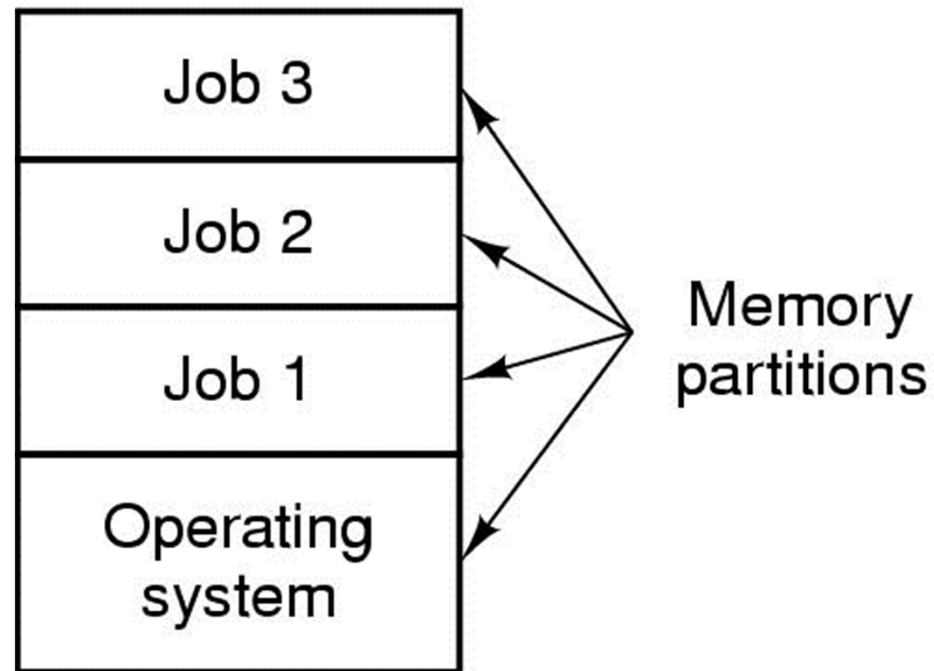
History of Operating Systems (3)



Structure of a typical FSM job (FortranMonitorSystem) – 2nd generation

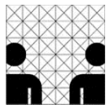


History of Operating Systems (4)



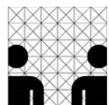
Multiprogramming system

- three jobs in memory

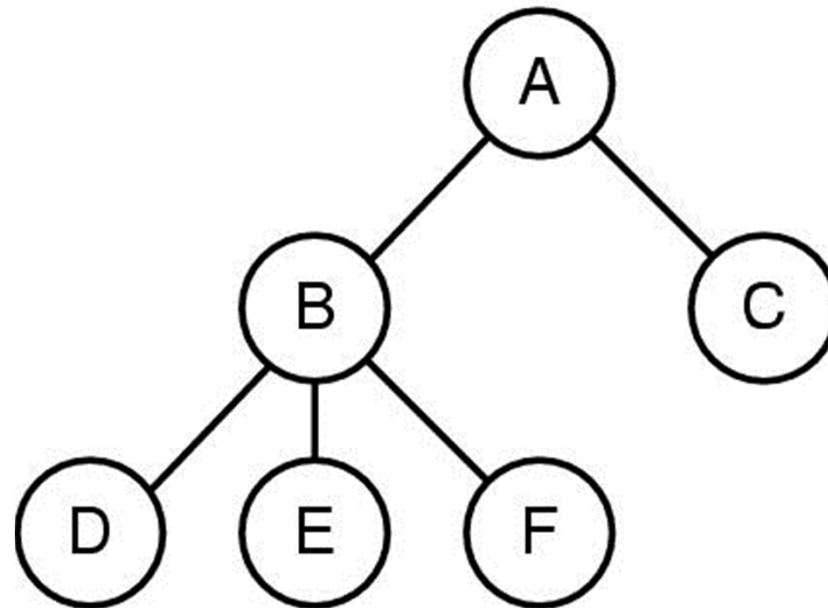


The Operating System Zoo

- Mainframe operating systems
- Server operating systems
- Multiprocessor operating systems
- Personal computer operating systems
- Real-time operating systems
- Embedded operating systems
- Mobile operating systems
- Smart card operating systems

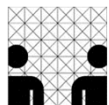


Operating System Concepts (1)

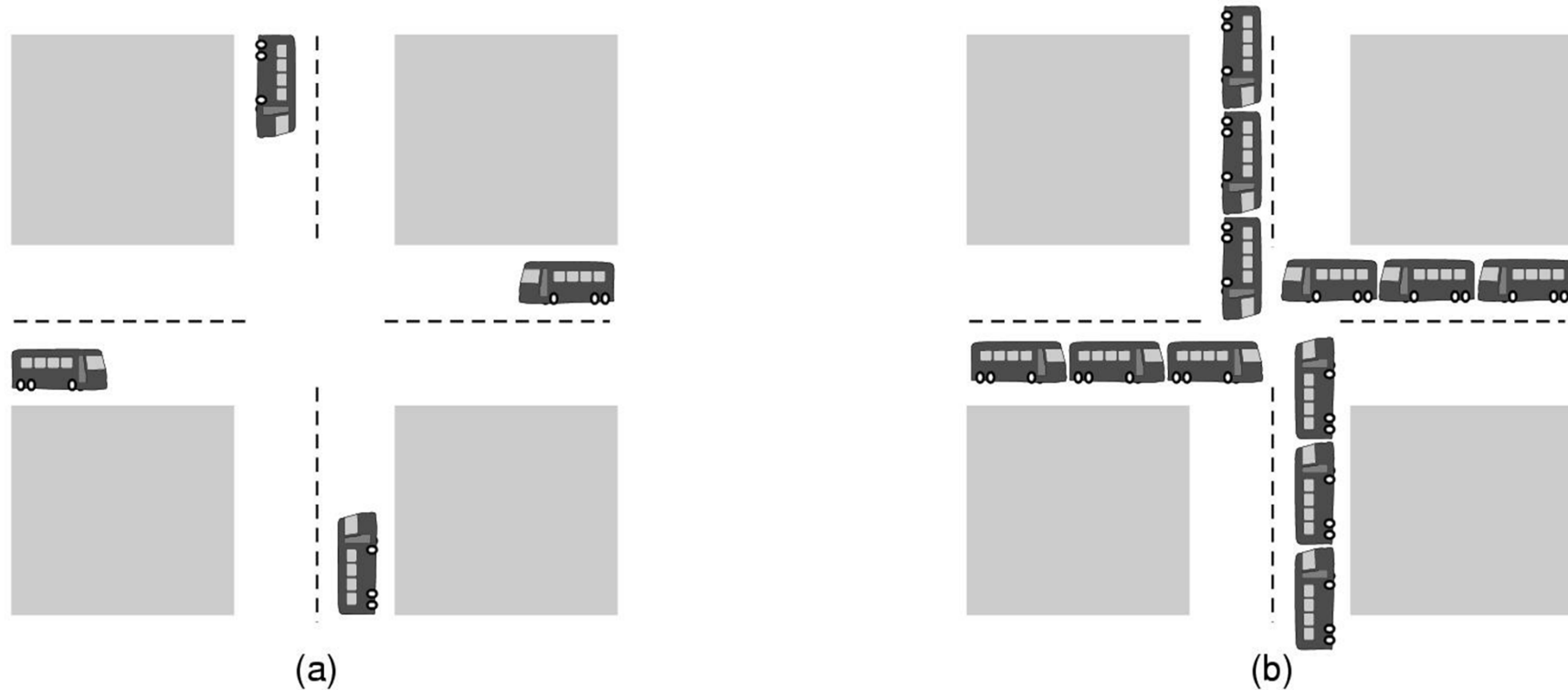


A process tree

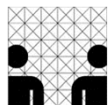
- A created two child processes, B and C
- B created three child processes, D, E, and F



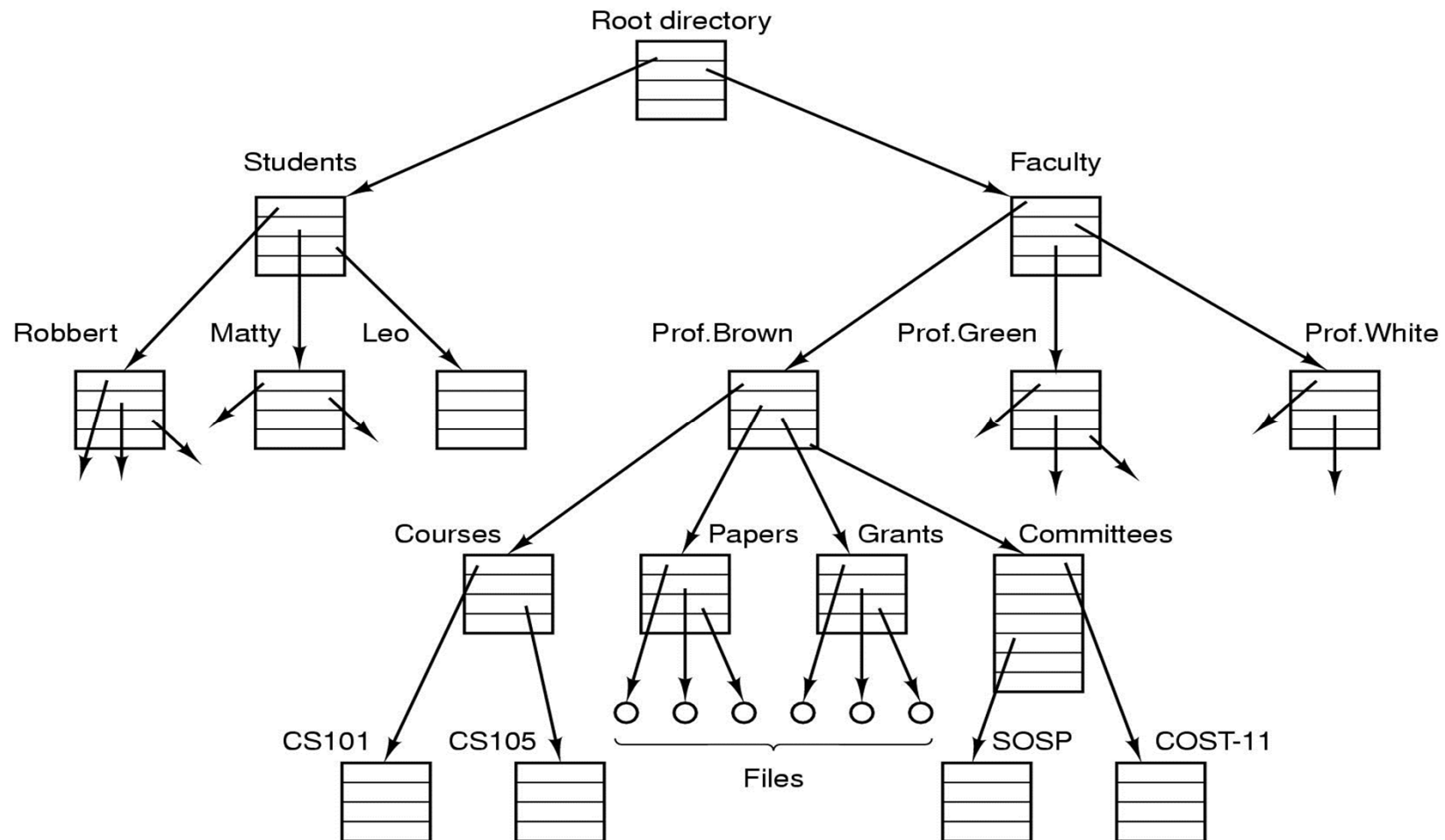
Operating System Concepts (2)



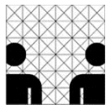
(a) A potential deadlock. (b) an actual deadlock.



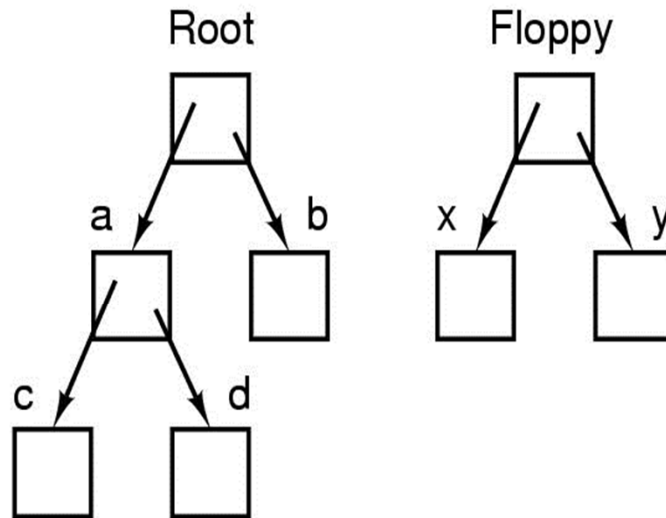
Operating System Concepts (3)



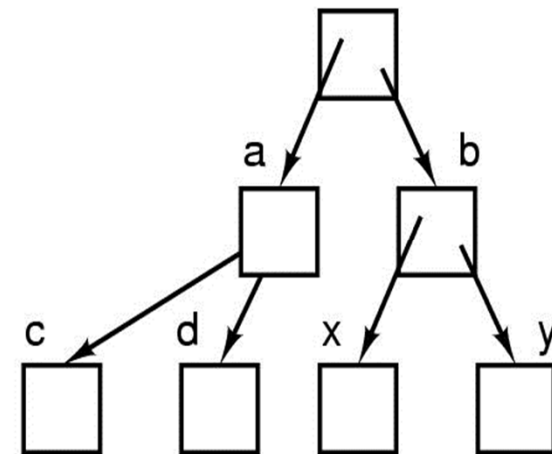
File system for a university department



Operating System Concepts (4)



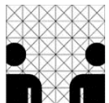
(a)



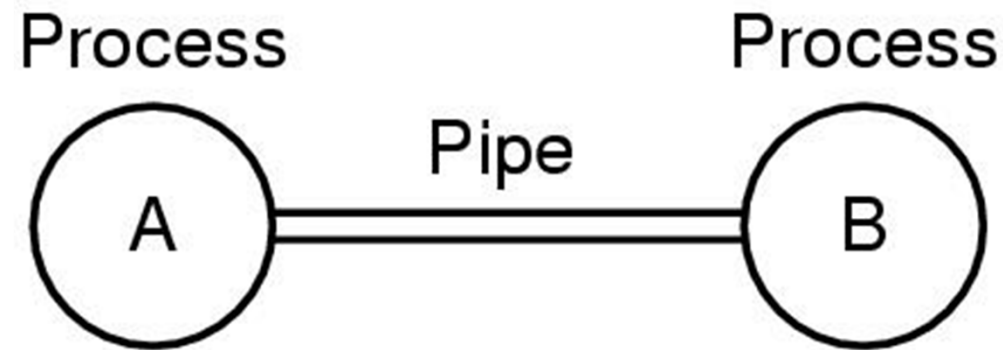
(b)

Dynamically changing file system:

1. Before mounting
 - files on floppy are inaccessible
2. After mounting floppy on b
 - files on floppy are part of file hierarchy

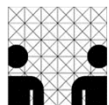


Operating System Concepts (5)

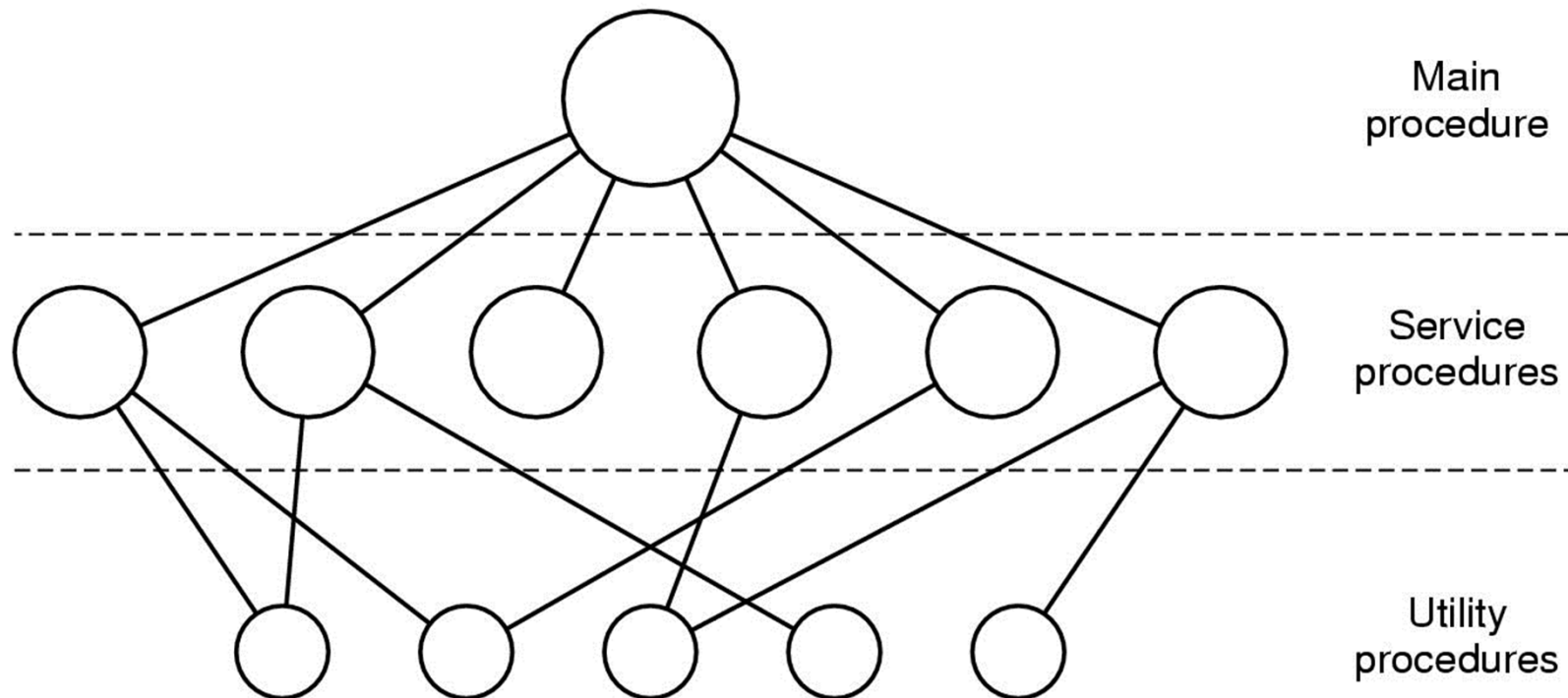


Process communication:

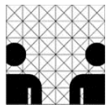
Two processes connected by a pipe



Operating System Structure (1)



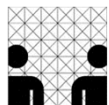
Procedures: Simple structuring model for a monolithic system



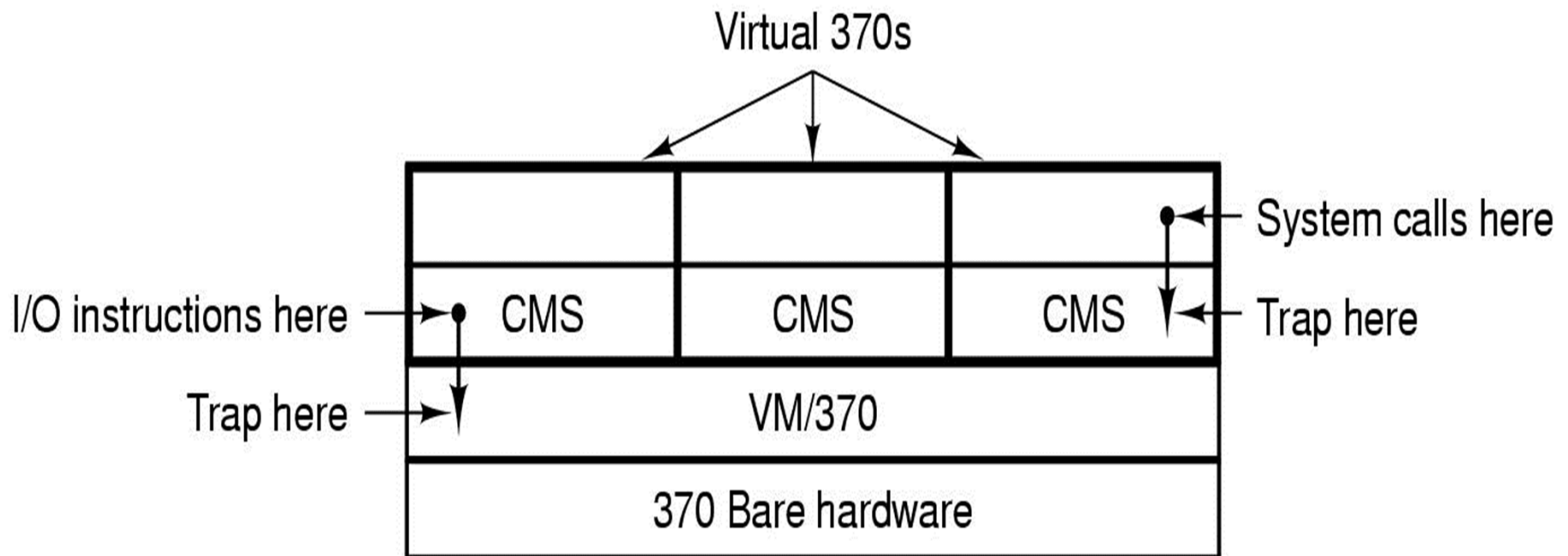
Operating System Structure (2)

Layer	Function
5	The operator
4	User programs
3	Input/output management
2	Operator-process communication
1	Memory and drum management
0	Processor allocation and multiprogramming

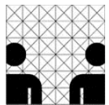
Early example: Structure of the THE operating system



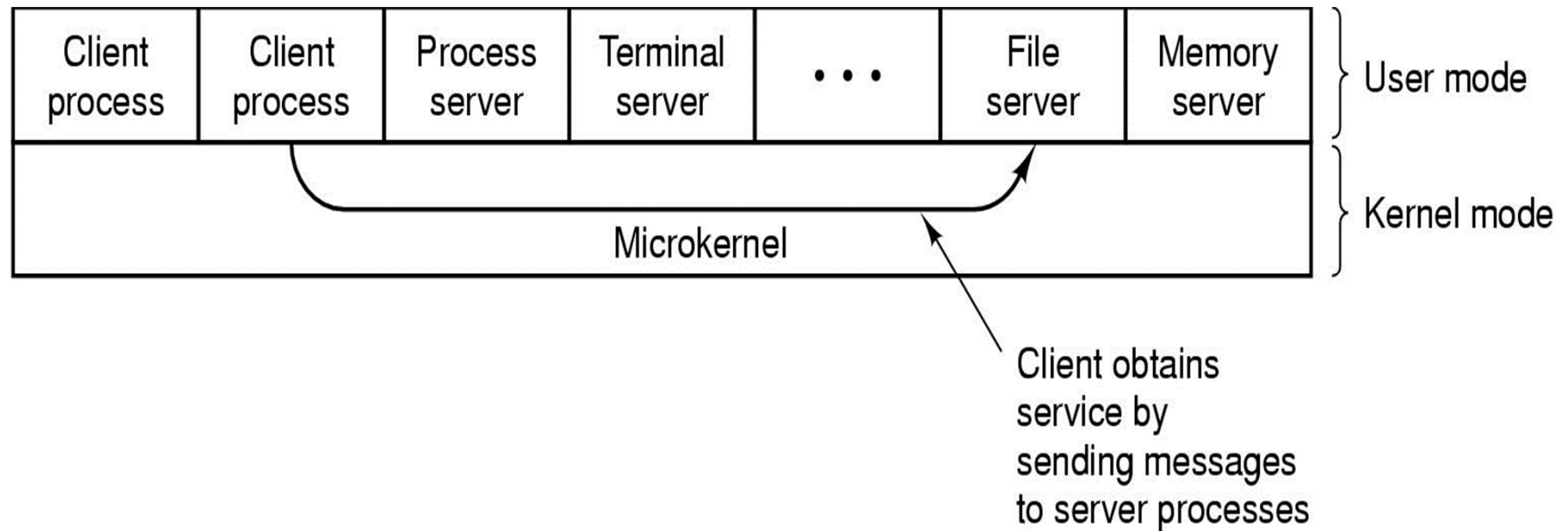
Operating System Structure (3)



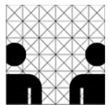
Multiple virtual OSs: Structure of VM/370 with CMS



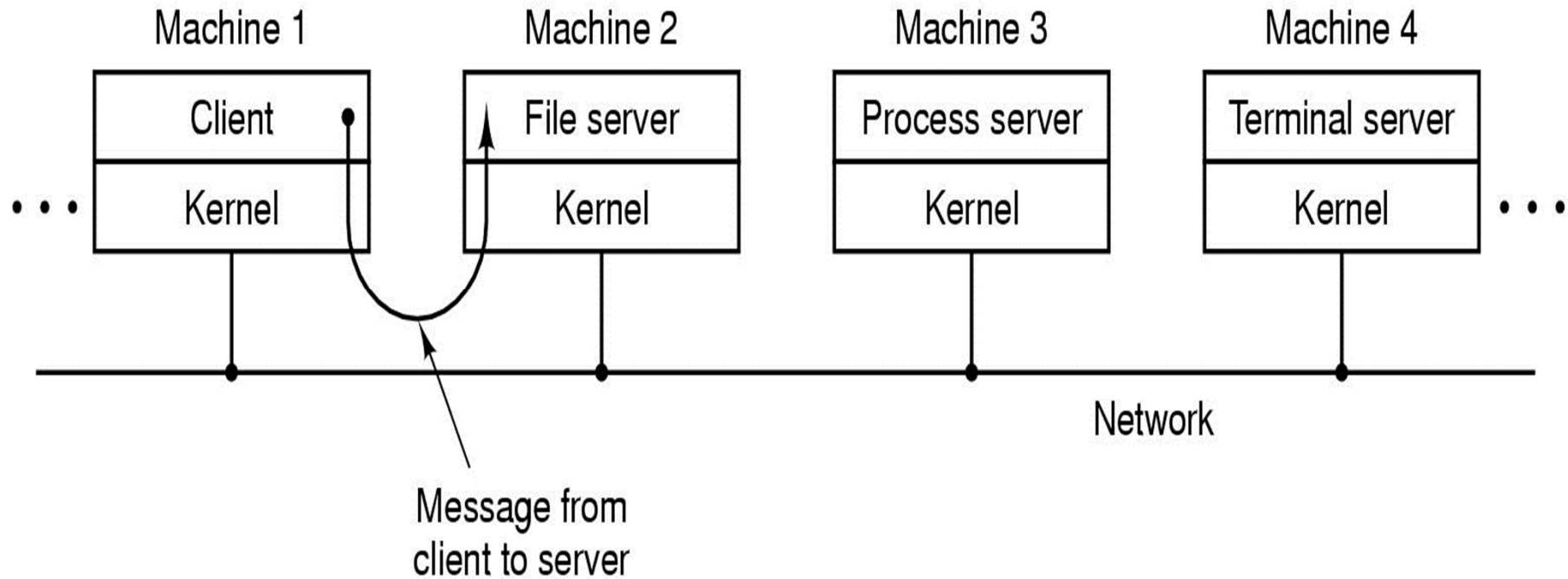
Operating System Structure (4)



OS Modularization: The client-server model



Operating System Structure (5)



Distribution: Client-server model in a distributed system

