EGR226 – OS & Networking
Lecture 2 – Overview of the OS

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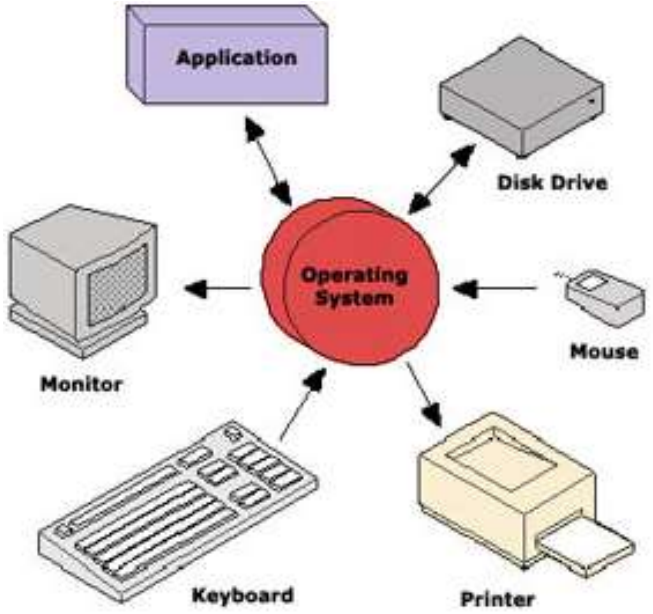
Today's Objectives

- What is an Operating System?
- A little bit of history
- Requirements and Components of an OS
  - Processes
  - Memory Management
  - SMP
- Windows
- UNIX
- Linux
- Android

An Operating System is a program that controls the execution of application programs

- It also serves as an interface between applications and hardware



Main objectives of an OS:

- Convenience
- Efficiency
- Ability to evolve

Computer Hardware and Software Infrastructure

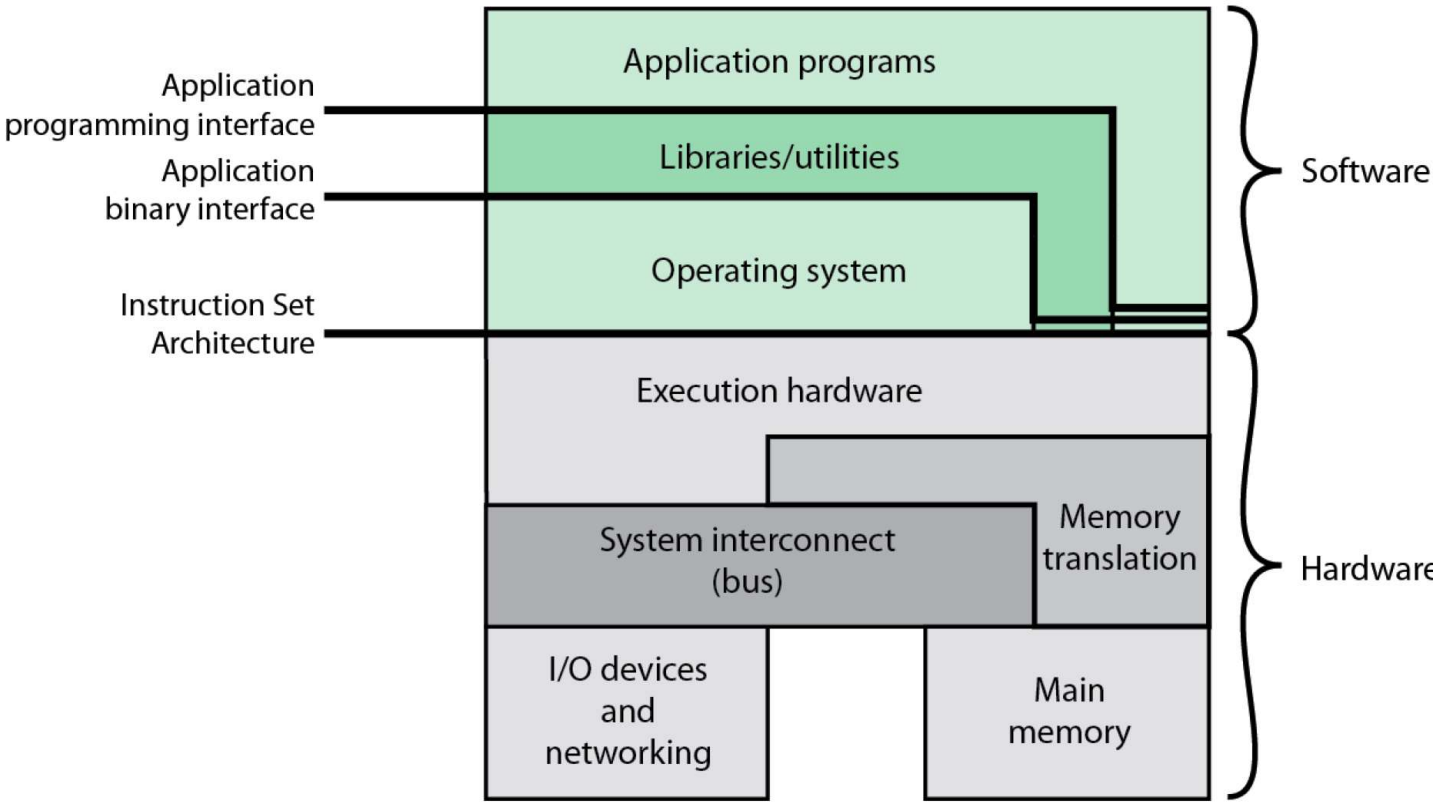
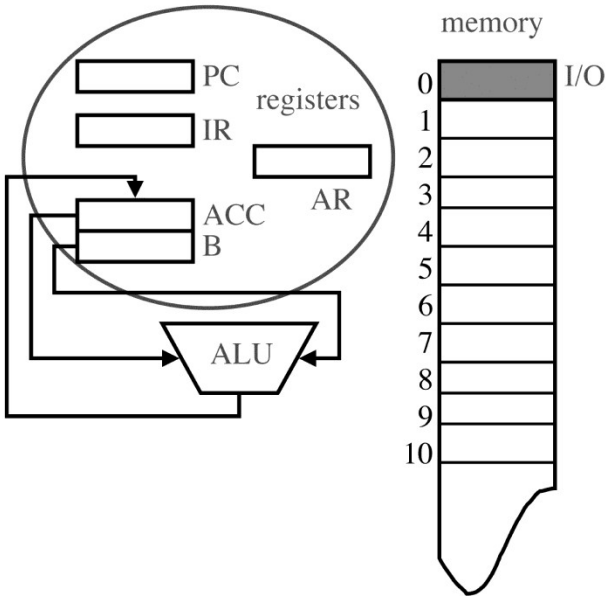
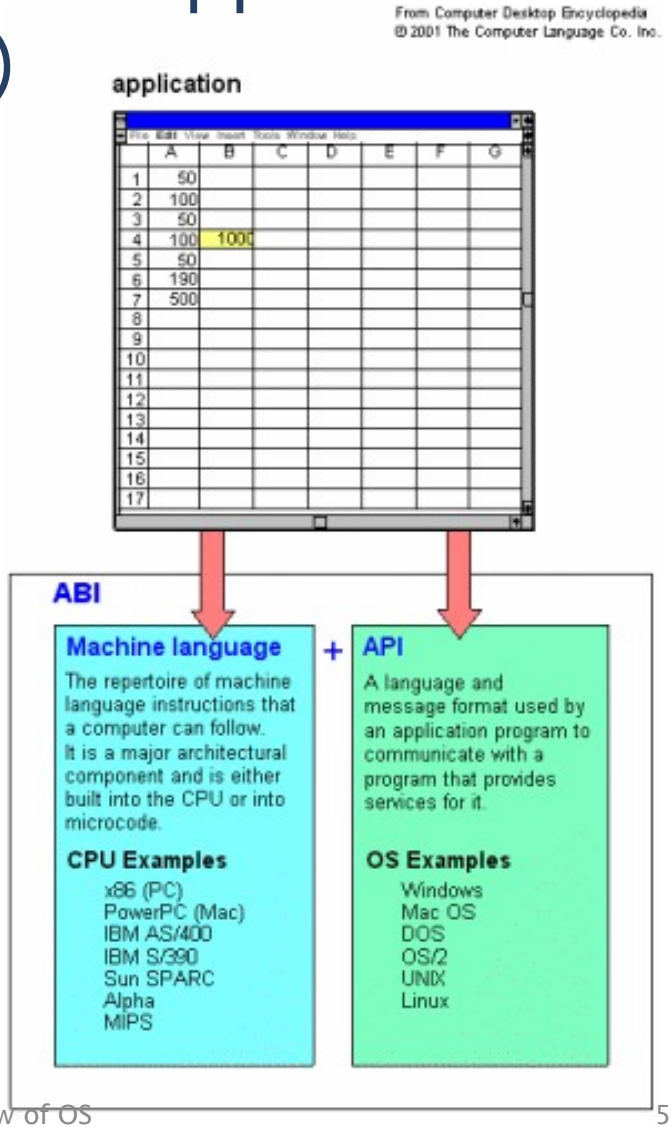


Figure 2.1 Computer Hardware and Software Infrastructure

Key Interfaces of the OS include the Instruction Set Architecture (ISA), Application Binary Interface (ABI) and one or more Application Programming Interfaces (API)





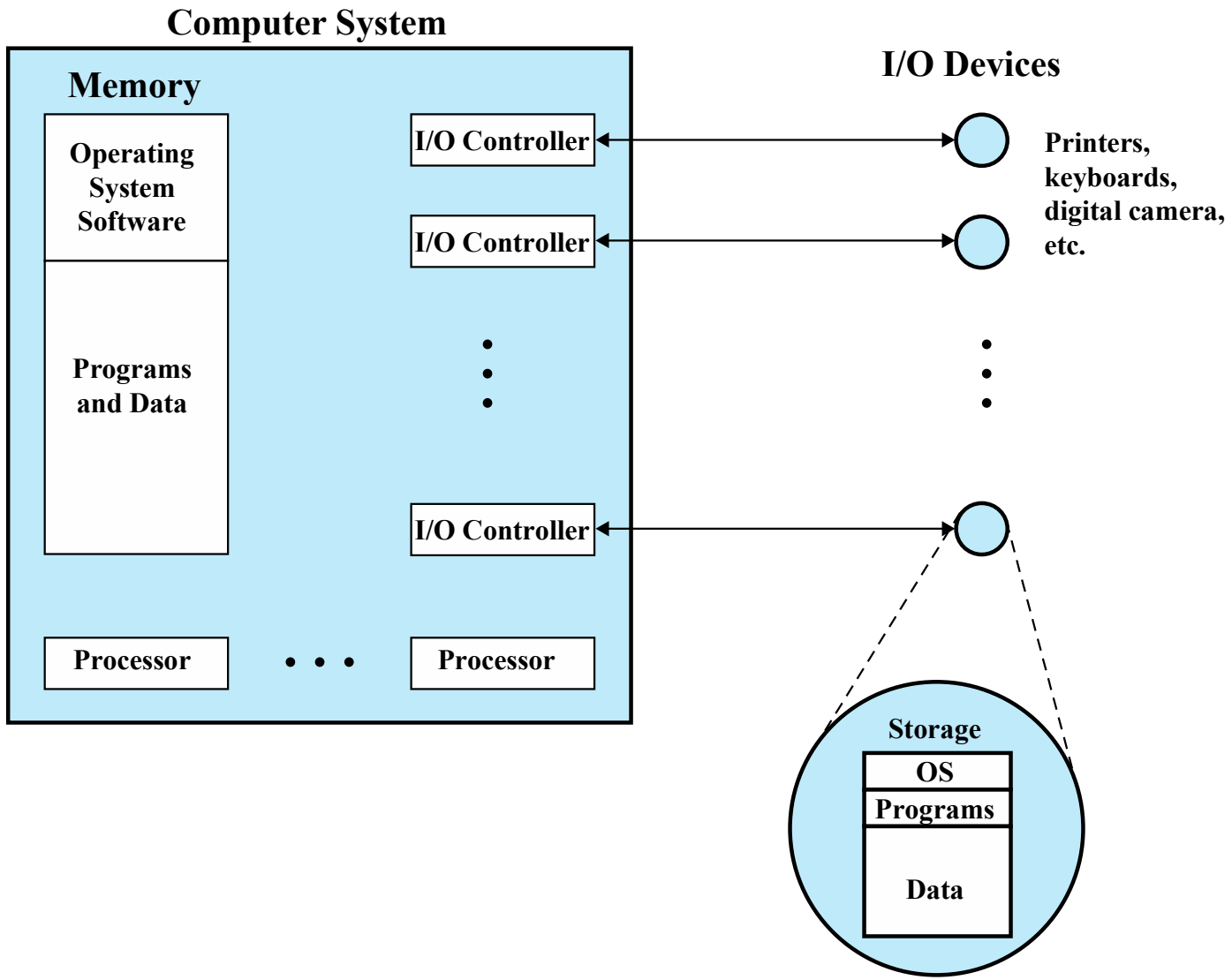
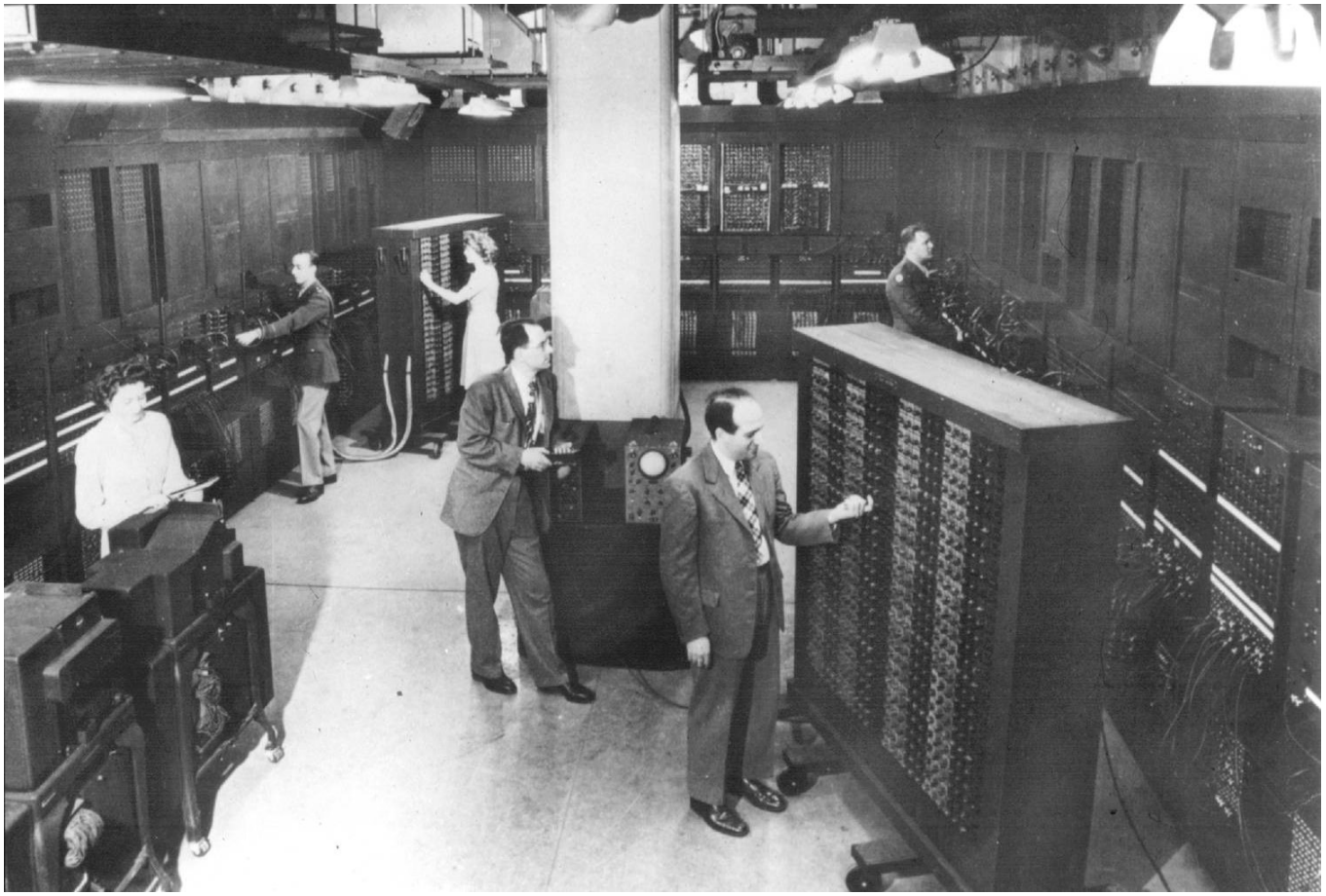


Figure 2.2 The Operating System as Resource Manager

ENIAC, from the late 1940's



Monitor Point of View

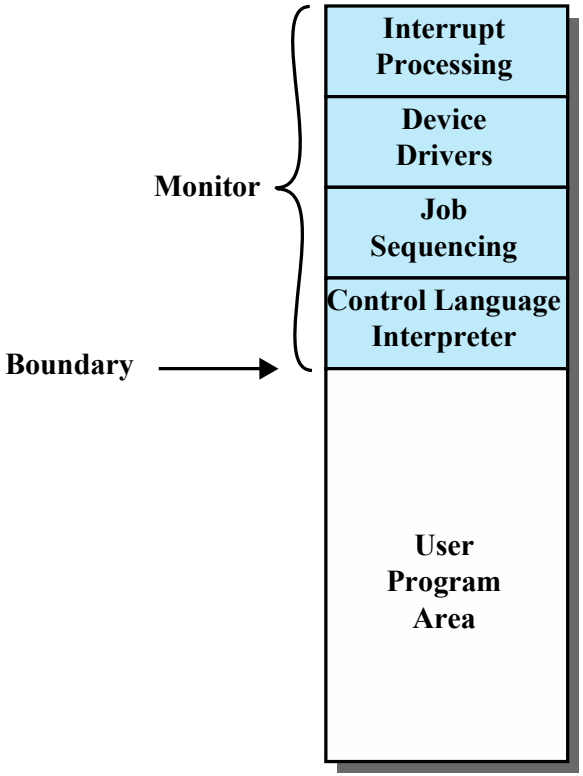
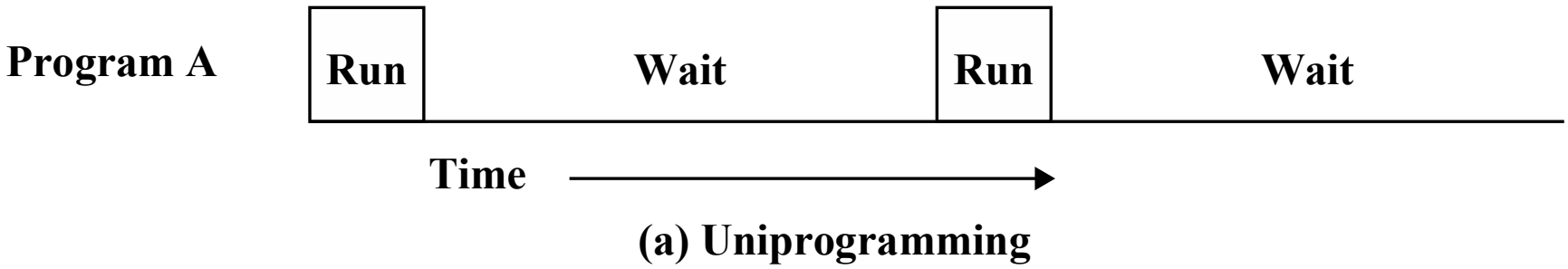


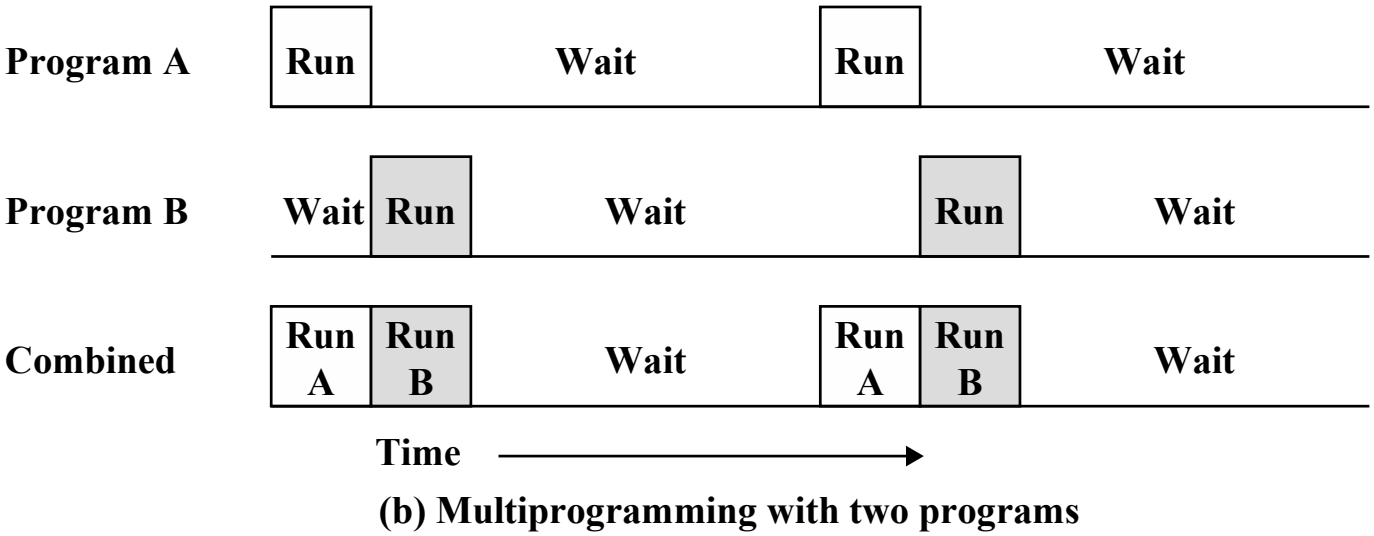
Figure 2.3 Memory Layout for a Resident Monitor

Uniprogramming



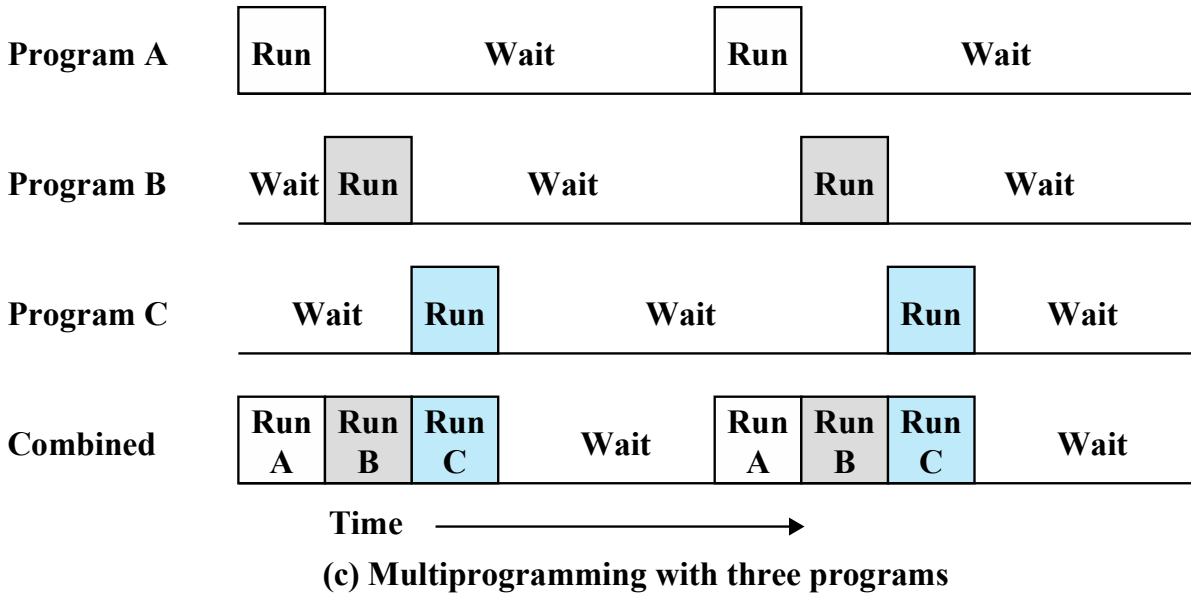
(a) Uniprogramming

Multiprogramming – two jobs



(b) Multiprogramming with two programs

Multiprogramming – three (and more) jobs



(c) Multiprogramming with three programs

Multiprogramming Example

	JOB1	JOB2	JOB3
Type of job	Heavy compute	Heavy I/O	Heavy I/O
Duration	5 min	15 min	10 min
Memory required	50 M	100 M	75 M
Need disk?	No	No	Yes
Need terminal?	No	Yes	No
Need printer?	No	No	Yes

Table 2.1 Sample Program Execution Attributes

Effects on Resource Utilization

	Uniprogramming	Multiprogramming
Processor use	20%	40%
Memory use	33%	67%
Disk use	33%	67%
Printer use	33%	67%
Elapsed time	30 min	15 min
Throughput	6 jobs/hr	12 jobs/hr
Mean response time	18 min	10 min

Table 2.2 Effects of Multiprogramming on Resource Utilization

Batch systems were inefficient when different jobs had different resource usage profiles

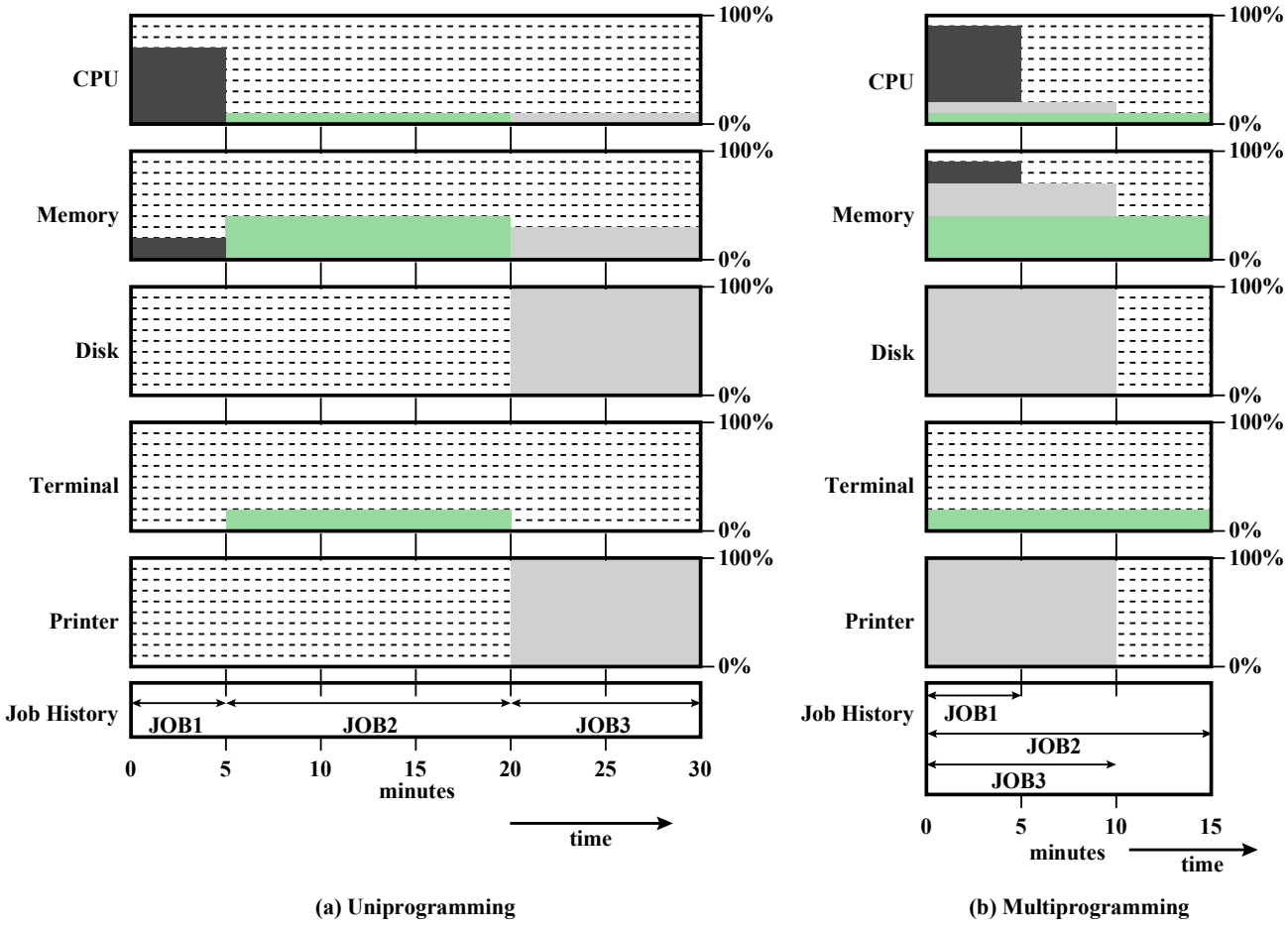


Figure 2.6 Utilization Histograms

IBM mainframe of the 1970's

Time-Sharing Systems

	Batch Multiprogramming	Time Sharing
Principal objective	Maximize processor use	Minimize response time
Source of directives to operating system	Job control language commands provided with the job	Commands entered at the terminal

DEC PDP-6 and IBM System 370 (1970's)

THAT'S HISTORY – LET'S DISCUSS TODAY'S OPERATING SYSTEMS

Process Management

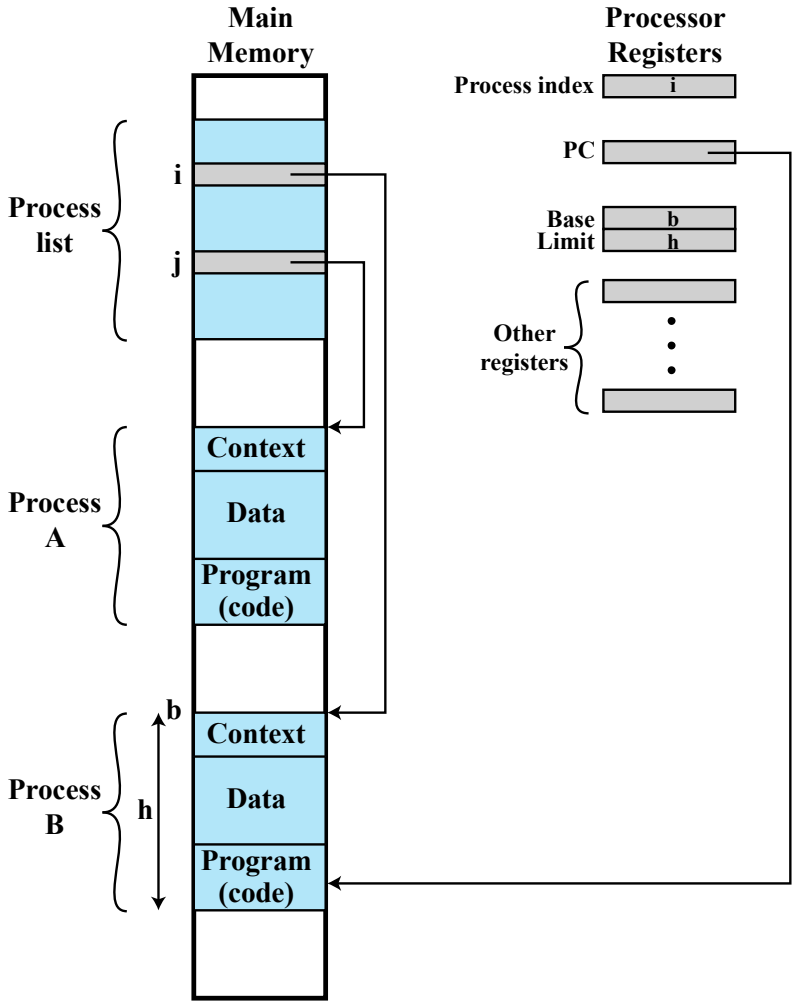
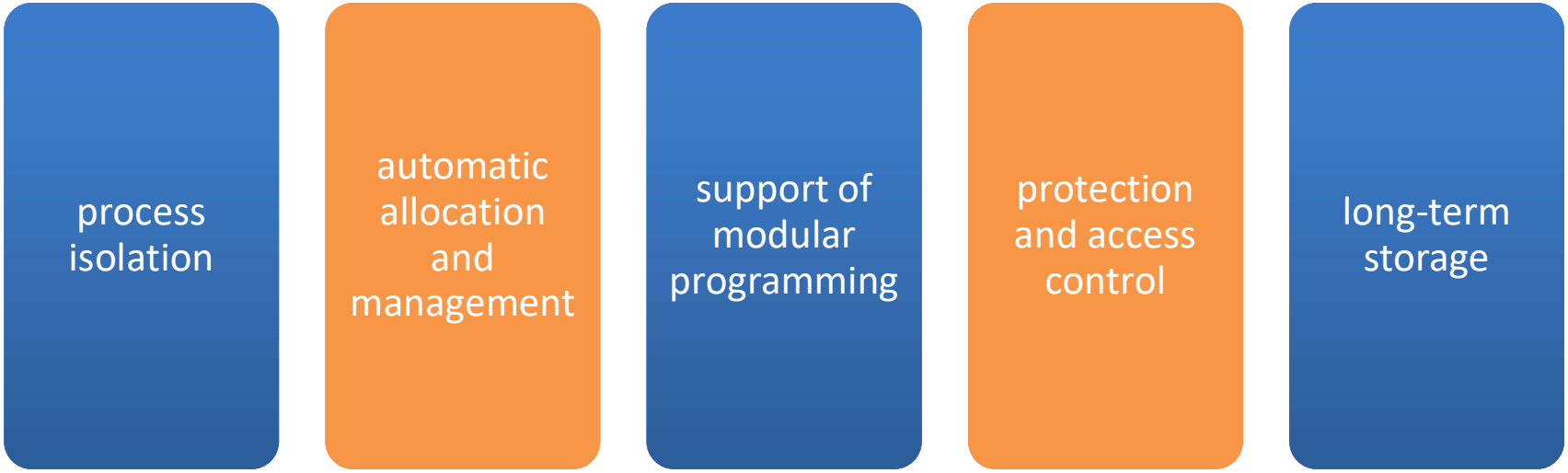


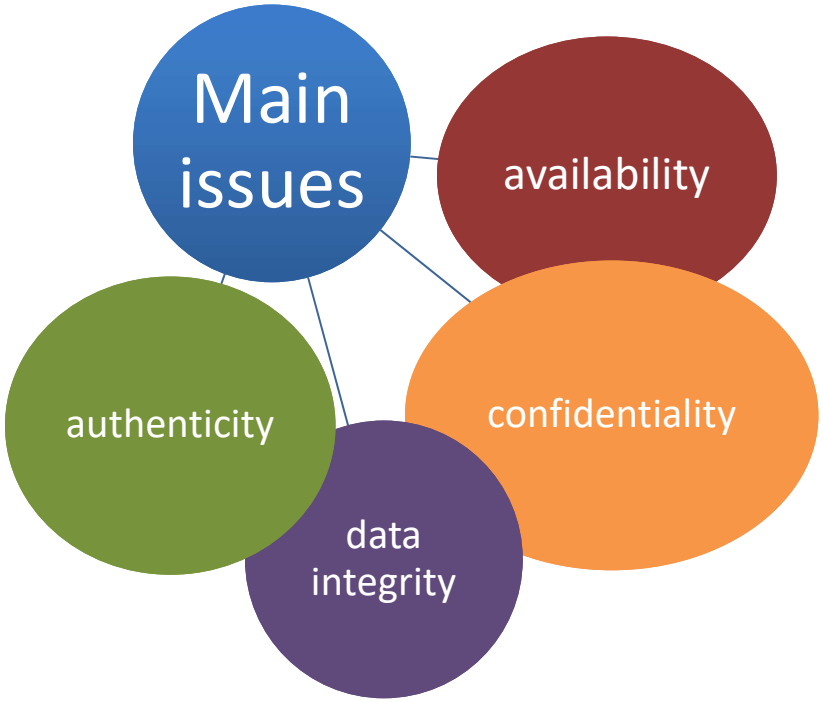
Figure 2.8 Typical Process Implementation

Memory Management

- The OS has five principal storage management responsibilities:

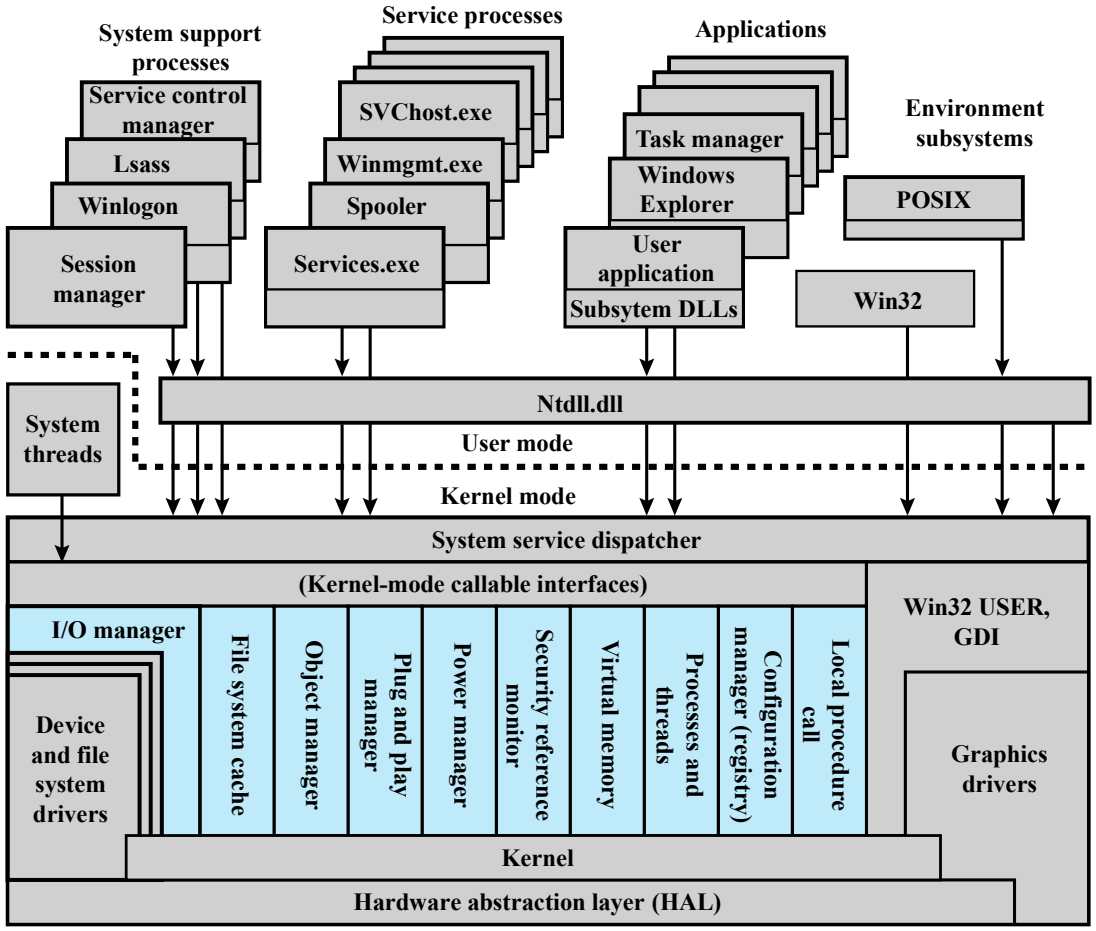


Information Protection and Security



Scheduling and Resource Management

A FEW NOTES ON SPECIFIC OPERATING SYSTEMS



Lsass = local security authentication server
POSIX = portable operating system interface
GDI = graphics device interface
DLL = dynamic link libraries

Colored area indicates Executive

Figure 2.14 Windows Architecture

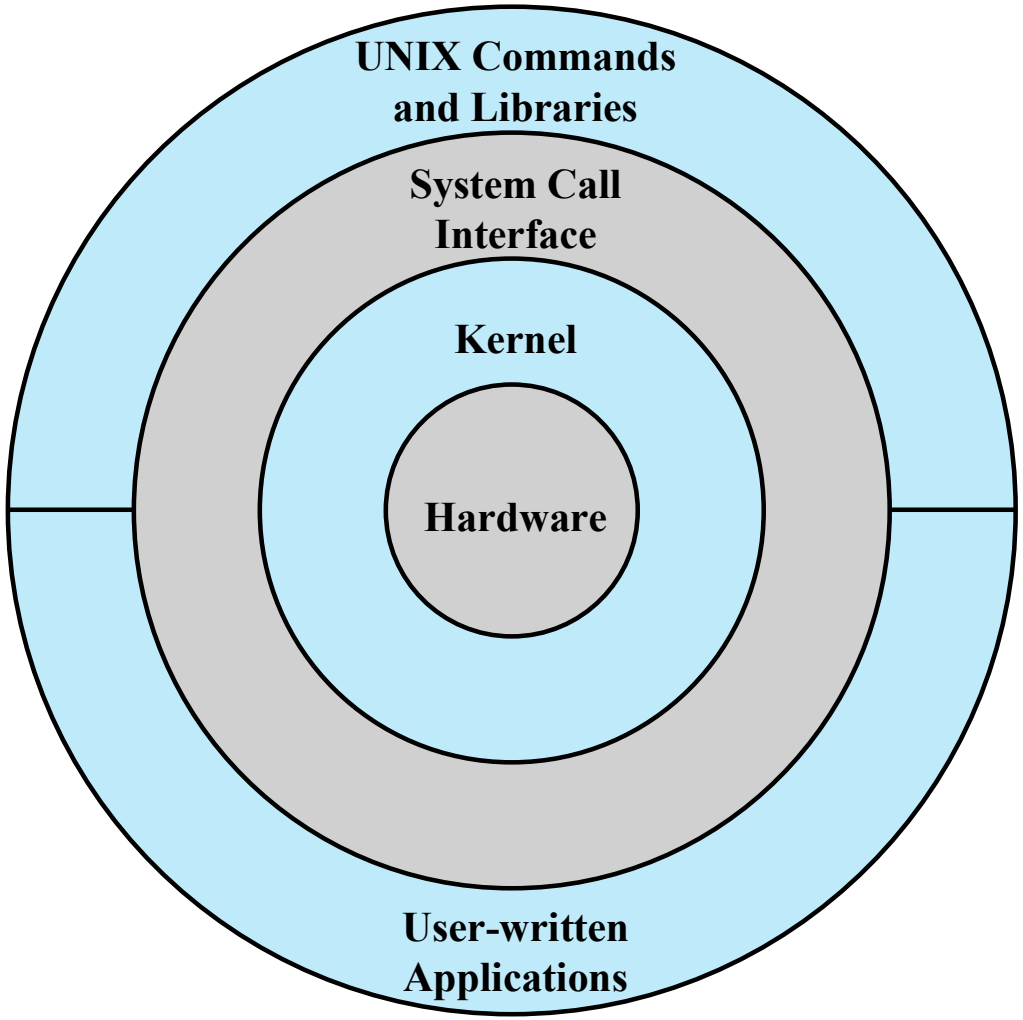


Figure 2.15 General UNIX Architecture

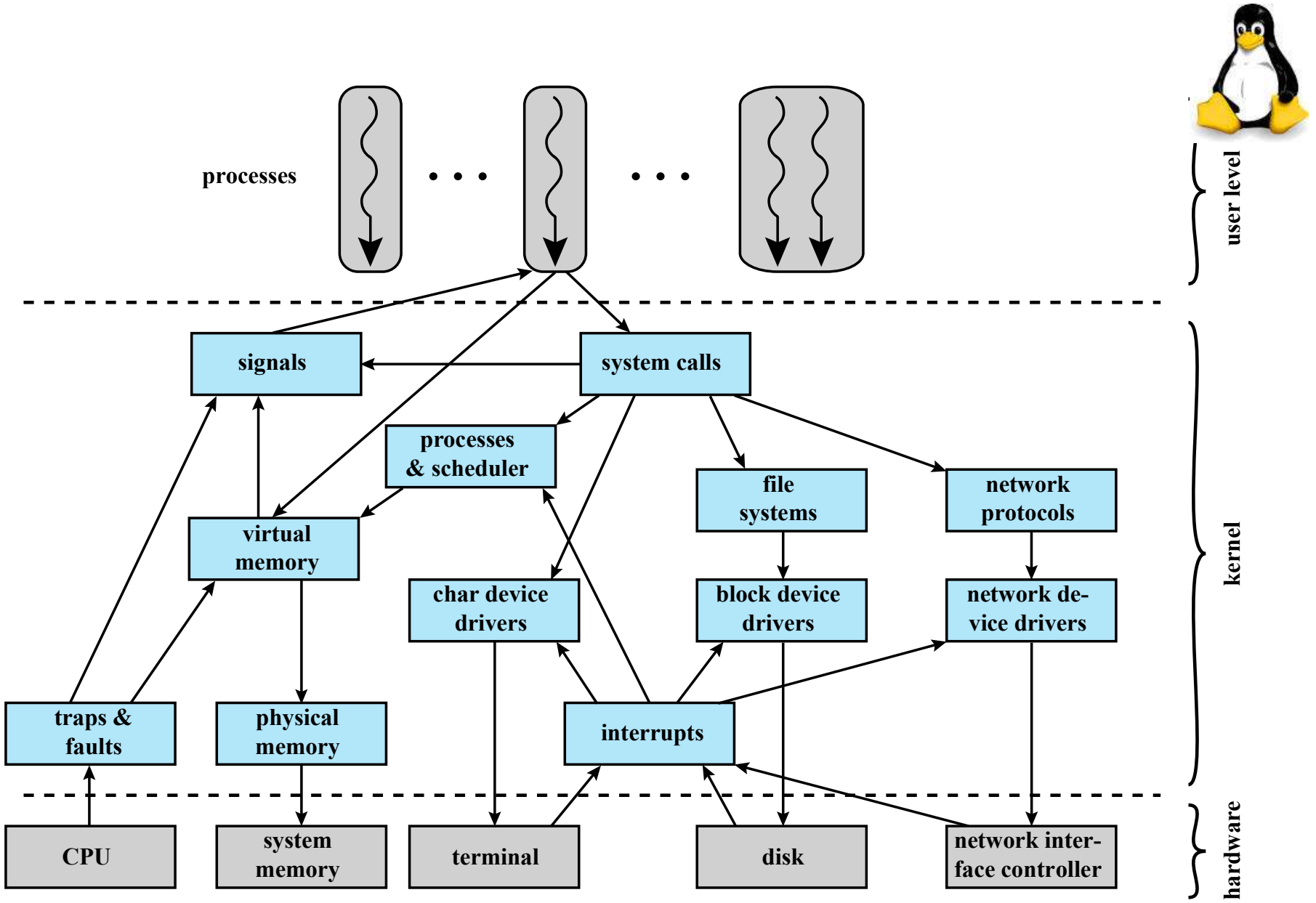


Figure 2.19 Linux Kernel Components

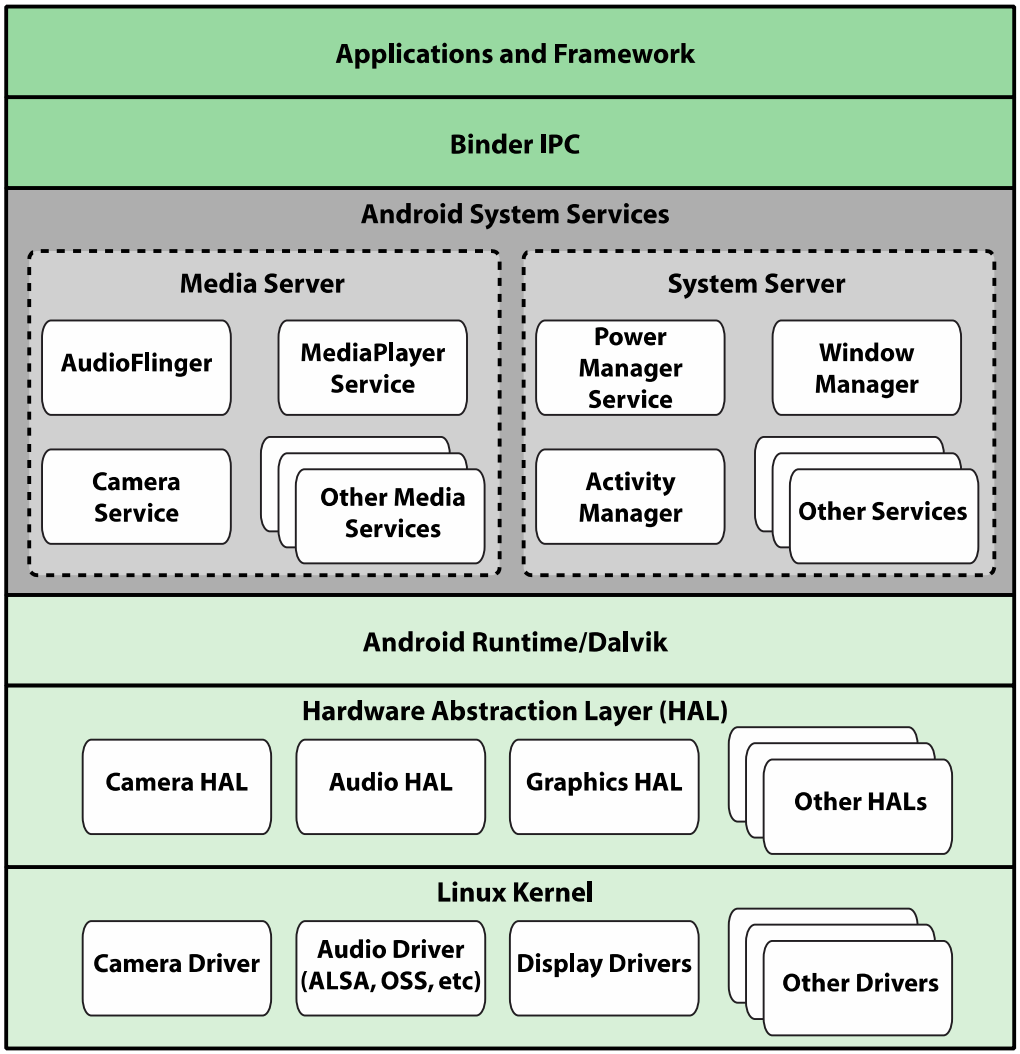


Figure 2.21 Android System Architecture

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