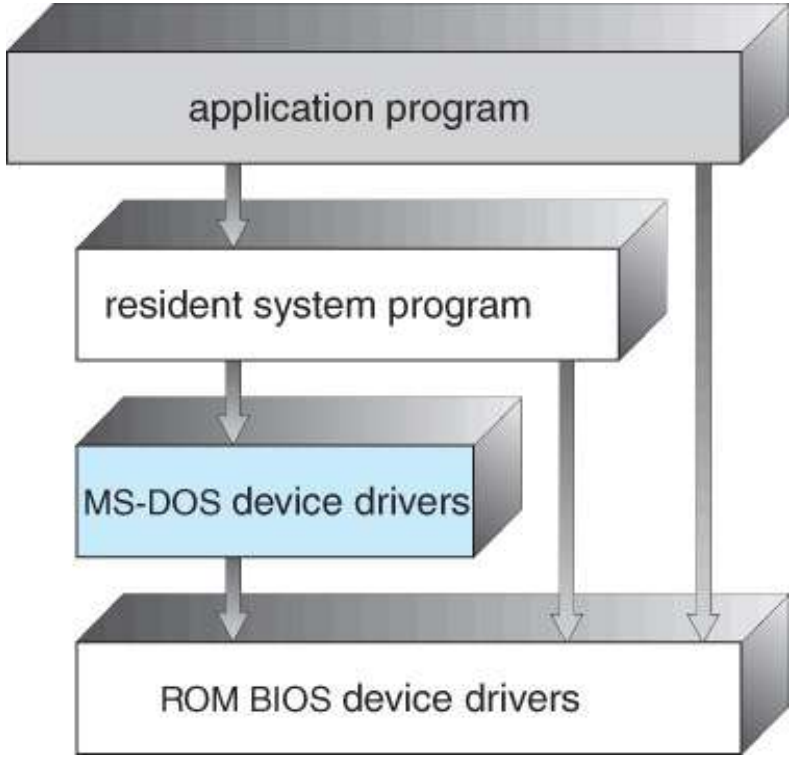
MS-DOS Structure: Simple Structure

No modular subsystems at all!

No separation between
user and kernel mode

PROs: easy to implement

CONs: rigidity, security



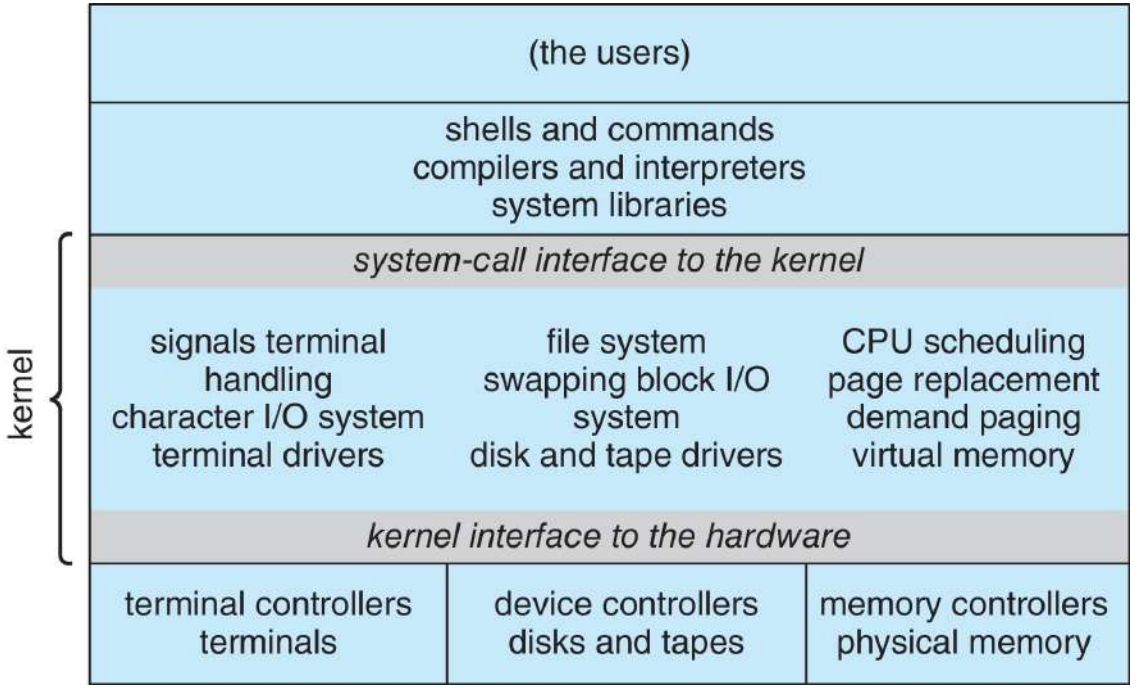
UNIX Structure: Traditional Monolithic Kernel

Essentially, one huge piece of software with all services living in the same address space as one big process

Most of modern OSs are variant of this traditional monolithic structure

PROs: efficiency, easy to implement

CONs: rigidity, security



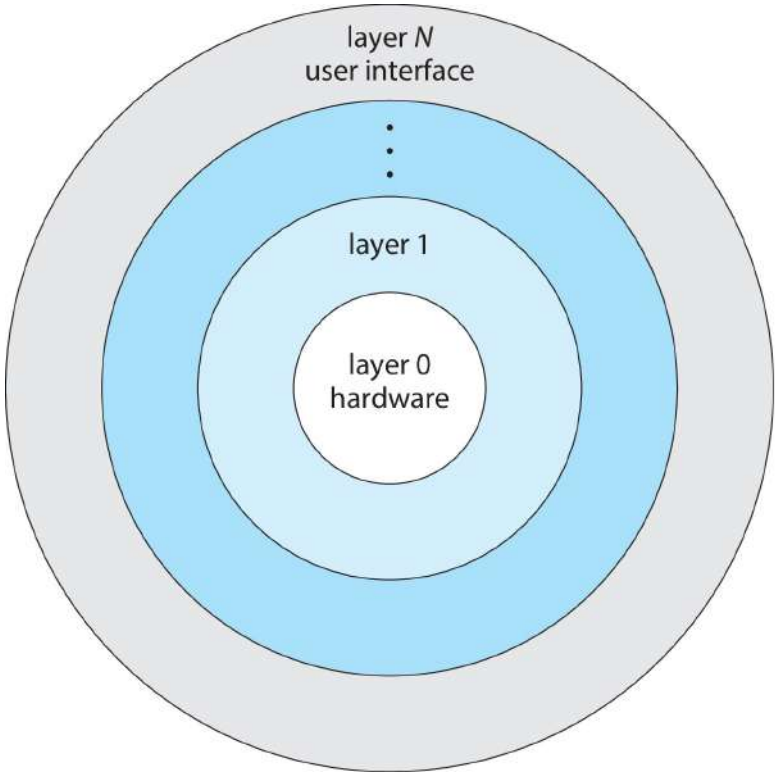
Layered Structure

The OS is divided into *N* layers
(HW = layer 0)

Each layer *L* uses the functionalities implemented by the layer *L-1* to expose new functionalities to layer *L+1*

PROs: modularity, portability, easy to debug

CONs: communication overhead, extra copy



Microkernel Structure

The opposite approach of monolithic

The kernel just contains very basic functionalities, everything else which is still logically part of the OS runs in user mode

Policy (user mode) vs. mechanism (microkernel) separation

PROs: security, reliability, extendibility

CONs: efficiency (message passing)