

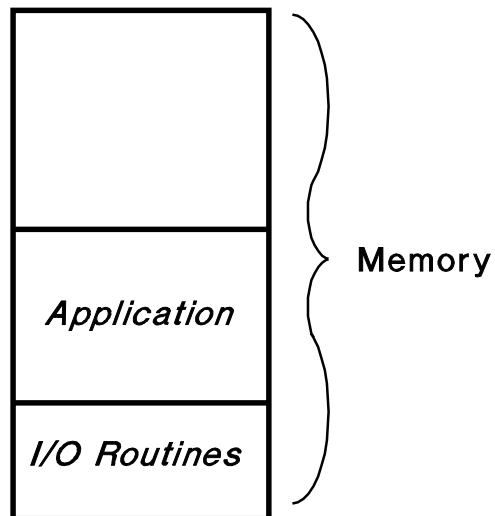
# Operating System

- Different concepts
  - single user
  - multiprogramming
  - multi-user

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## Operating System Evolution

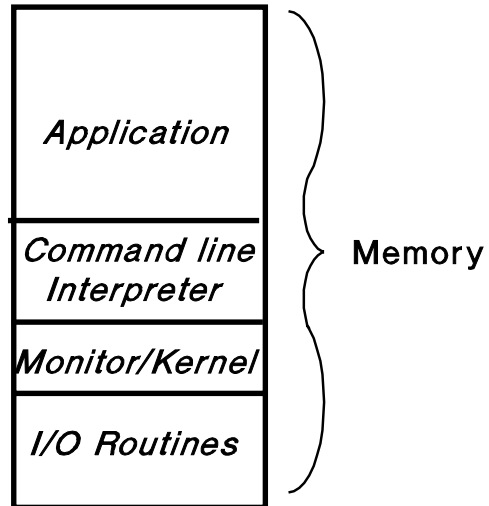
*Basic Input Output*



2

# Operating System Evolution

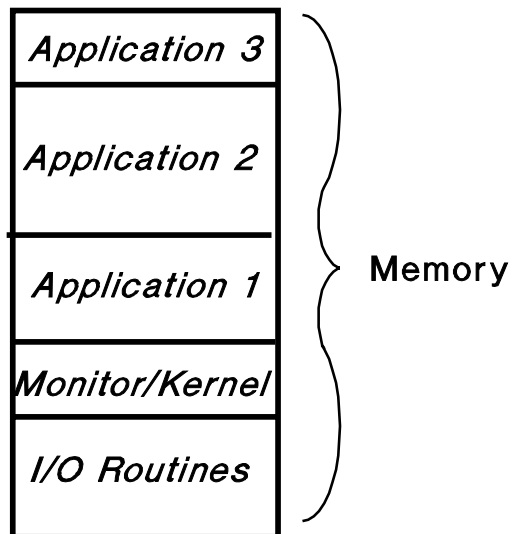
*Single User*



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# Operating System Evolution

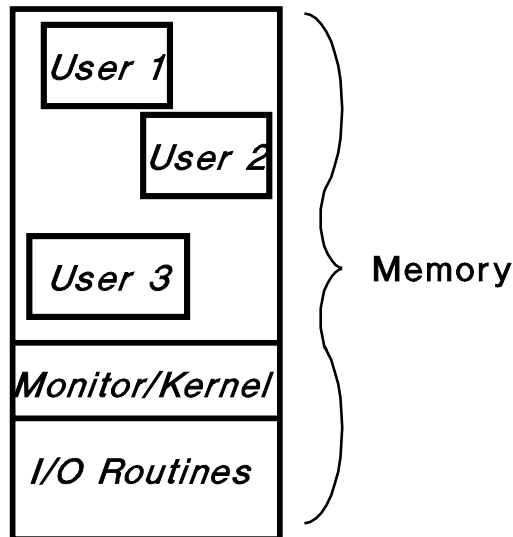
*Multiprogramming*



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# Operating System Evolution

*Multi-User*



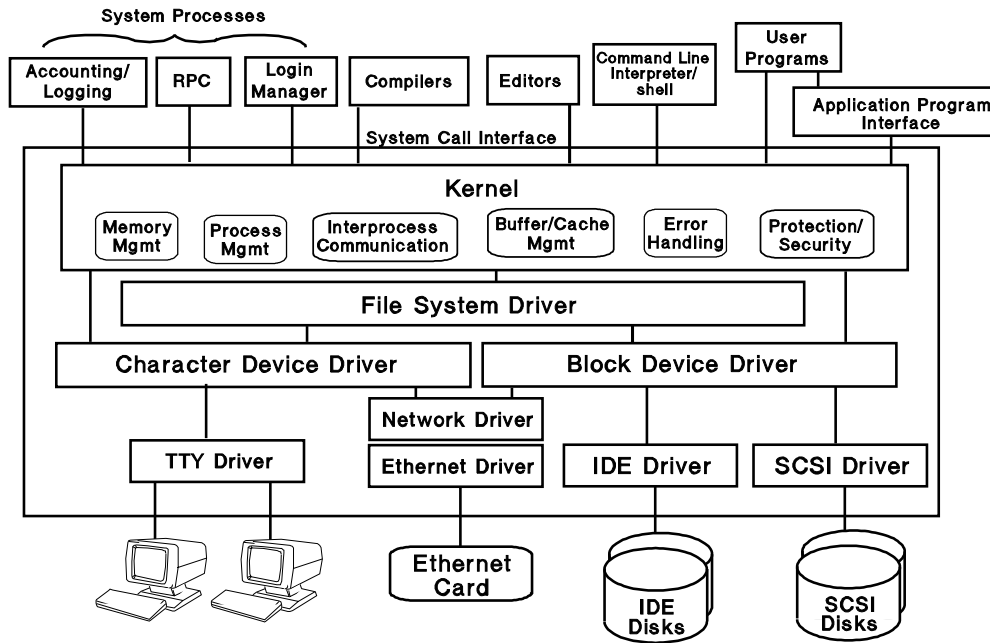
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# Operating System Functions

- *Process Management*
- *Main Memory Management*
- *File Management*
- *I/O System Management*
- *Secondary Storage Management*
- *Networking*
- *Protection*
- *Accounting/Logging*
- *Command Interpreter/GUI*

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# Operating System Overview



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# Linux

- a free Unix-type OS
- adheres to the POSIX standard:  
Portable Operating System Interface  
[for Unix]
- what came before?

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# MULTICS

- Multics (Multiplexed Information and Computing Service)
- mainframe area
- early OS (late 60s)
- last Multics system shut down in 2000, Canadian Dept. National Defense

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# UNICS

- Ken Thompson wanted “fast” response OS for “Space Wars” game
  - implemented UNICS (“UNI” versus “MULTI” from Multics)
  - implemented in assembly language for PDP-7

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# UNIX

- Dennis Ritchie suggested to rewrite the OS using C
  - which he had developed from B
  - initial concern that C would not be fast enough
  - still some assembly code
  - Bell Labs started using this UNIX and utilities like `no` and `troff` were developed

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# BSD UNIX

- Improvements made to Unix by UC Berkeley grad students
  - first good memory management system
  - first real networking capability
  - 1970 BSD UNIX was distributed to general public

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# System III and V

- Breakup of Bell Systems allowed AT&T to start selling UNIX licenses
  - System III and System V (mid 80s)
  - later System V Release 4

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# Evolution

- No clear winner between System V and BSD Unix. Following are System V based, but incorporate BSD features:
  - Solaris (Sun Microsystems)
  - HP-UX (HP)
  - AIX (IBM)
  - IRIS (Silicon Graphics)

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# Open Source Software

- Free software?
  - freedom to use, view, and modify
- Early days: Richard Stallman wrote version of Emacs and made available to public
  - he started GNU Project “GNU’s not Unix”
  - GNU C Compiler
- Free Software Foundation <http://www.fsf.org>

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# Linux

- Linus Torvalds posts message in newsgroup
  - who wants to participate? 1991
  - playing with MINIX he wanted to write “performance code”
  - release of Linux 1.0 (Linux = Linus’ Minix) under GNU GPL (General Public License) in 1994
  - first a few friends - now thousands of volunteer developers
  - 1996 Linux 2.0 became major competitor to other OSs, including commercial Unix

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# Linux vs Unix

- They are not the same!
  - no shared code
  - but: same POSIX standard
  - look and feel almost the same
  - **BUT** under the hood they are different!