

UNIT I

INTRODUCTION





OPERATING SYSTEM SERVICES

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- **User interface** - Almost all operating systems have a user interface (**UI**).
- Varies between **Command-Line (CLI)**, **Graphics User Interface (GUI)**, **Batch**
- **Program execution** - The system must be able to load a program into memory and to run that program, end execution, either normally or abnormally (indicating error)
- **I/O operations** - A running program may require I/O, which may involve a file or an I/O device
- **File-system manipulation** - Programs need to read and write files and directories, create and delete them, search them, list file Information, permission management.
- **Error detection** – OS needs to be constantly aware of possible errors



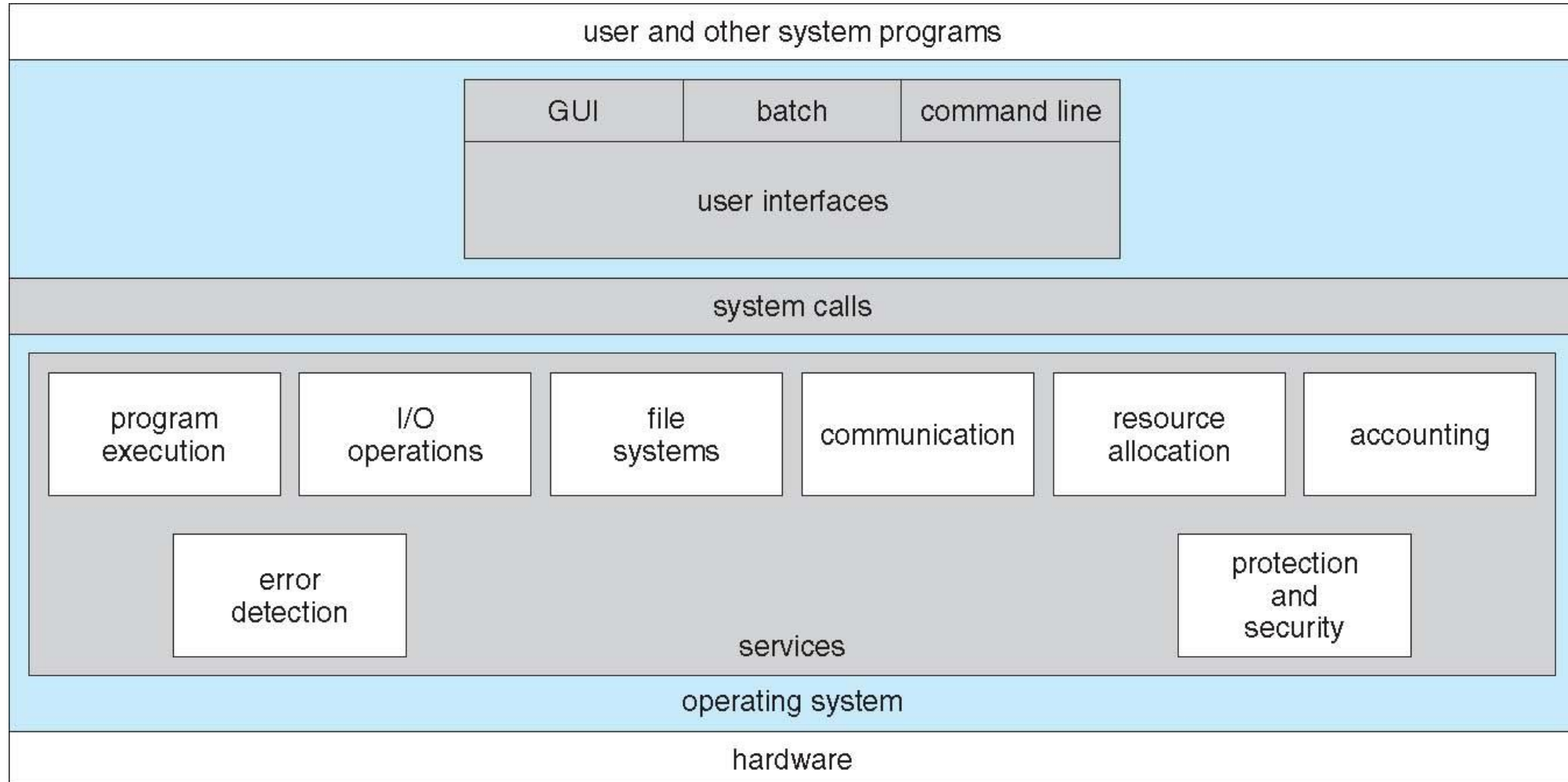
OPERATING-SYSTEM SERVICES

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- **Communications** – Processes may exchange information, on the same computer or between computers over a network may be **via shared memory or through message passing**
- **Resource allocation** - When multiple users or multiple jobs running concurrently, resources must be allocated to each of them - CPU cycles, main memory, file storage, I/O devices.
- **Accounting** - To keep track of which users use how much and what kinds of computer resources
- **Protection and security** - The owners of information stored in a multiuser or networked computer system may want to control use of that information, concurrent processes should not interfere with each other



A View of Operating System Services





User Operating System Interface - CLI

CLI or **command interpreter** allows direct command entry

- Sometimes implemented in **kernel**, sometimes by **systems program**
- Sometimes multiple flavors implemented – **shells**
- Primarily fetches a command from user and executes it
- Sometimes commands built-in, sometimes just names of programs
 - If the latter, adding new features doesn't require shell modification



```
Default
New Info Close Execute Bookmarks
Default Default
PBG-Mac-Pro:~ pb$ w
15:24 up 56 mins, 2 users, load averages: 1.51 1.53 1.65
USER      TTY      FROM              LOGIN@   IDLE   WHAT
pb$        console -                14:34    50    -
pb$        s000    -                15:05    -    w
PBG-Mac-Pro:~ pb$ iostat 5
            disk0      disk1      disk10      cpu      load average
            KB/t tps MB/s      KB/t tps MB/s      KB/t tps MB/s  us sy id 1m 5m 15m
33.75 343 11.30    64.31 14 0.88    39.67 0 0.02 11 5 84 1.51 1.53 1.65
5.27 320 1.65     0.00 0 0.00     0.00 0 0.00  4 2 94 1.39 1.51 1.65
4.28 329 1.37     0.00 0 0.00     0.00 0 0.00  5 3 92 1.44 1.51 1.65
^C
PBG-Mac-Pro:~ pb$ ls
Applications          Music                  WebEx
Applications (Parallels) Pando Packages        config.log
Desktop               Pictures               getsmartdata.txt
Documents             Public                 imp
Downloads             Sites                  log
Dropbox              Thumbs.db              panda-dist
Library              Virtual Machines       prob.txt
Movies               Volumes                scripts
PBG-Mac-Pro:~ pb$ pwd
/Users/pb$
PBG-Mac-Pro:~ pb$ ping 192.168.1.1
PING 192.168.1.1 (192.168.1.1): 56 data bytes
64 bytes from 192.168.1.1: icmp_seq=0 ttl=64 time=2.257 ms
64 bytes from 192.168.1.1: icmp_seq=1 ttl=64 time=1.262 ms
^C
--- 192.168.1.1 ping statistics ---
2 packets transmitted, 2 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 1.262/1.760/2.257/0.498 ms
PBG-Mac-Pro:~ pb$
```



User Operating System Interface - GUI

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- User-friendly **desktop** metaphor interface , Invented at Xerox PARC
 - Usually mouse, keyboard, and monitor
 - **Icons** represent files, programs, actions, etc
 - Various mouse buttons over objects in the interface cause various actions
- Many systems now include **both CLI and GUI interfaces**
 - **Microsoft Windows** is GUI with CLI “command” shell
 - **Apple Mac OS X** is “Aqua” GUI interface with UNIX kernel underneath and shells available
 - Unix and Linux have CLI with optional GUI interfaces (CDE, KDE, GNOME)



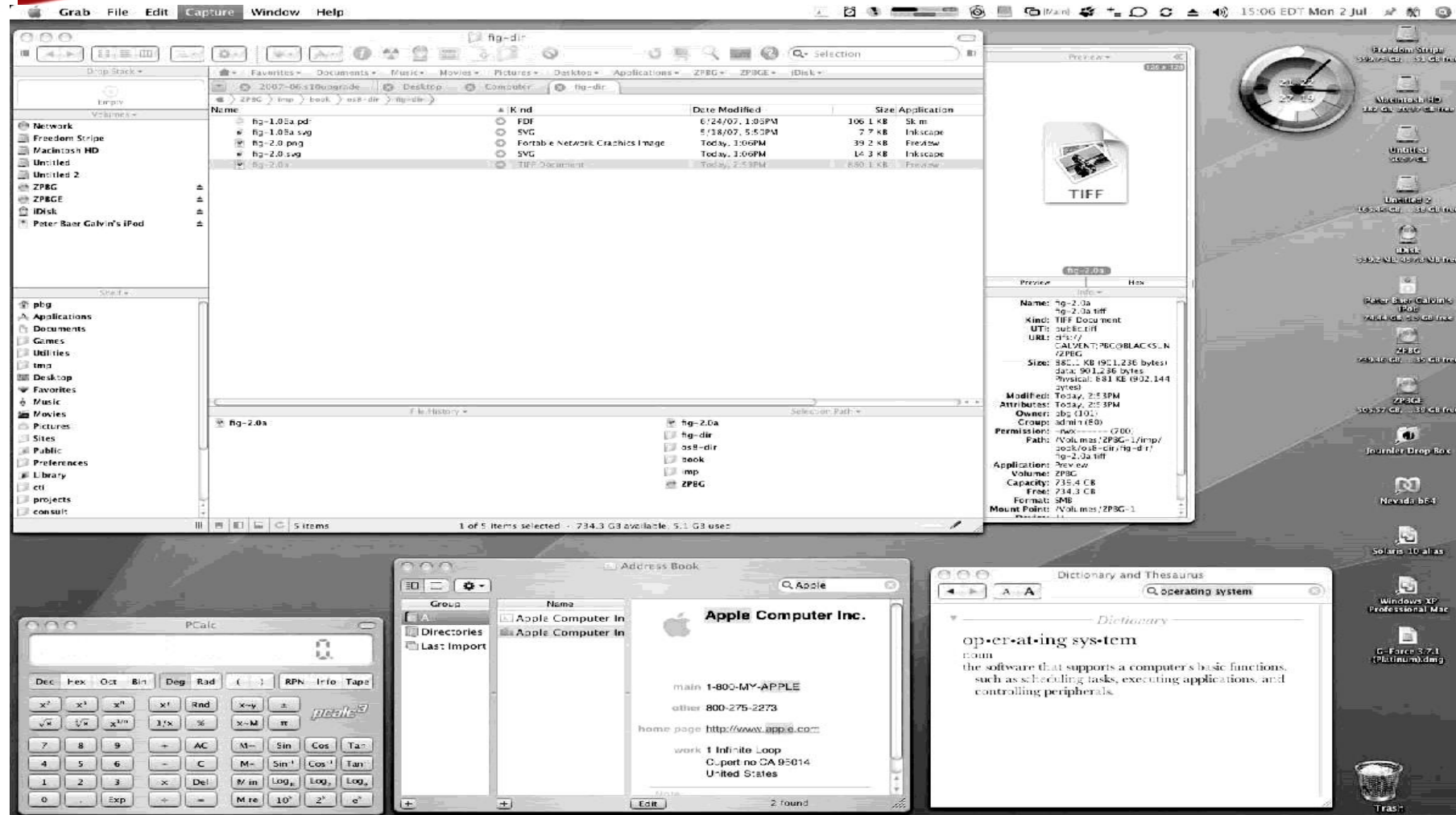
Touchscreen Interfaces

- Touchscreen devices require new interfaces
 - Mouse not possible or not desired
 - Actions and selection based on gestures
 - **Virtual keyboard** for text entry
 - **Voice commands.**





The Mac OS X GUI





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INSTITUTIONS

TEXT BOOK

1. Abraham Silberschatz, Peter B. Galvin, “Operating System Concepts”, 10th Edition, John Wiley & Sons, Inc., 2018.
2. Andrew S Tanenbaum, Herbert Bos, Modern Operating Pearson , 2015.

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1. Ramaz Elmasri, A. Gil Carrick, David Levine, “ Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2. William Stallings, Operating Systems: Internals and Design Principles, 7th Edition, Prentice Hall, 2018
3. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016

THANK YOU