Operating Systems

User Interfaces

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Topics covered in this lecture

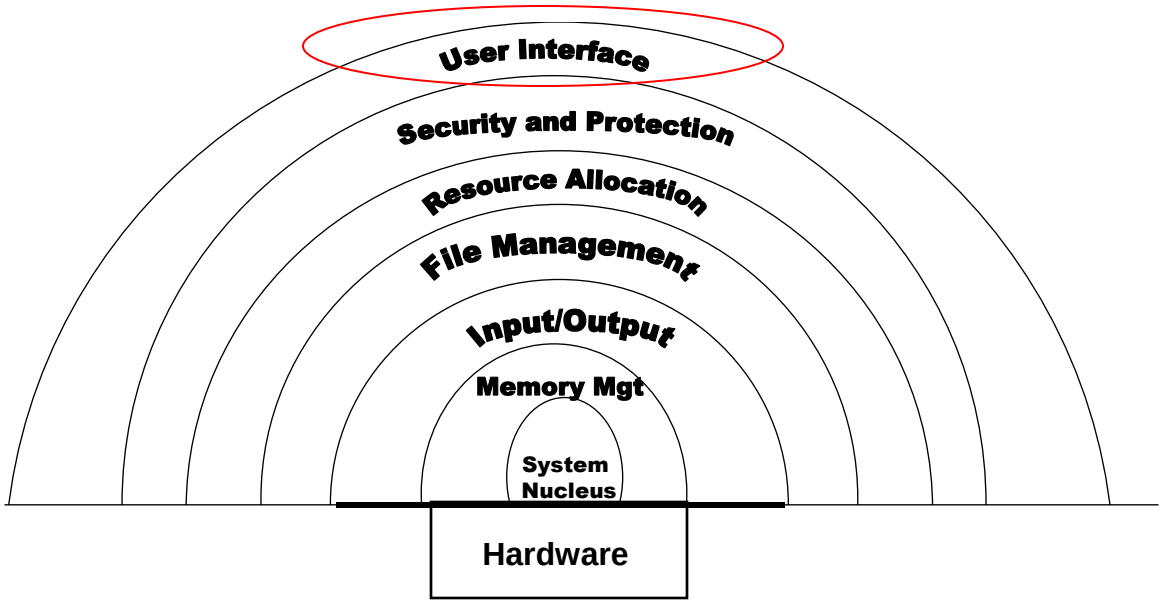
- **Different types of User Interface**
  - **Command Line Interface (CLI)**
  - **Graphical User Interface (GUI)**
  - **Batch Interface**
  - **Application Programming Interface (API)**
- **Different types of user**
  - **Programmer**
  - **Operational User**
  - **End-User**
- **Relationship between user types and interface types**
- **User interfaces under Windows and Unix**

2.1 User Interfaces

- **User Interface (UI) is the outermost layer of a logical operating system**

- **Definition:**

  UI is a hardware and software which facilitate communication between the user and the computer.



2.2 User – Computer Communication Mechanism

- **UI uses a two way communication mechanism**
  - ***USER* => *COMPUTER* communication using input devices such as mouse, keyboard, touch screen, microphone, etc. It tells the computer what you want to do.**
  - ***COMPUTER* => *USER* communication using output devices such as monitor, printer, speaker, etc. The computer shows you what it did.**

- **Both user and computer exchange data or instructions through these devices.**

2.3 Types of User Interface

Various types of User Interface:

- **Command Line Interface (CLI)**
- **Graphical User Interface (GUI)**
- **Batch Interface (Job Control Interface)**
- **Application Programming Interface (API) (System calls)**

2.3 Types of User Interface

Command Line Interface (CLI)

- ***Command Line*** **= blank line on screen ready to receive instructions (commands) from the user**
- **CLI allows a user to interact with a computer using a text terminal that provides a command line (prompt)**
- **CLI accepts as input lines of text from the computer's keyboard and mouse? and provides as output a text displayed on the computer monitor or a sound**

Have you used a CLI?

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **How CLI works?**
  - **the user types a command on the keyboard**
  - **the user terminates the command usually with the 'Enter' key**
  - **the computer executes the command**
  - **the computer provides textual output**
- **A number of commands can be grouped in a file and we execute them as a group**
- ***Command line interpreter (shell)* = A program that implements the CLI**
  - **Examples:**
    - Unix's shells (sh, ksh, csh, tcsh, bash, etc.)
    - DOS's Command.com ("Command Prompt")
    - MS Windows offers CLI in a command window

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **DOS Command Prompt (Windows)**
- **Command Format**

doAction toFile

or

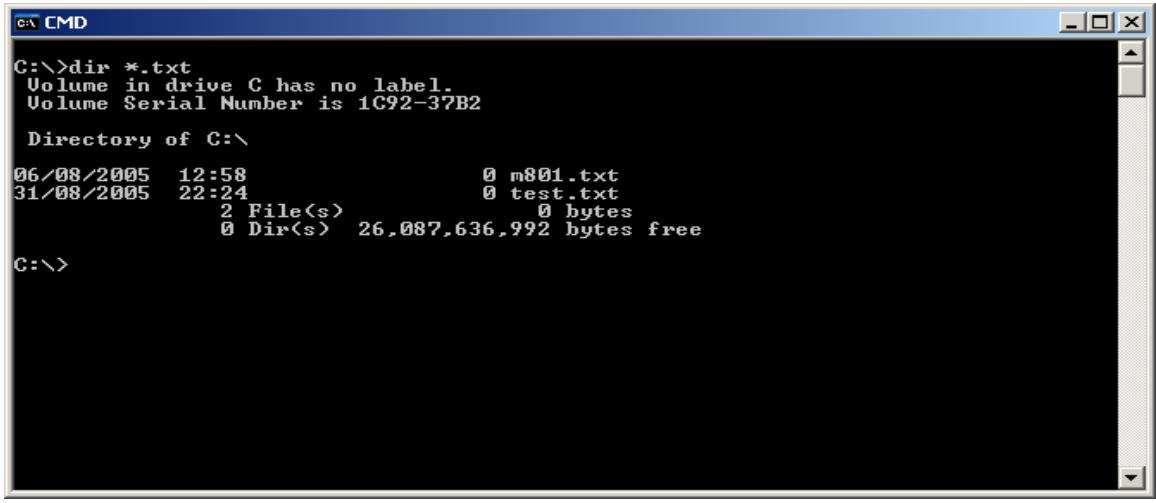
doAction < inputFile > outputFile

Examples

dir

echo Hello!

echo Hello! >myfile.txt



***doAction* – a command (e.g. open, print) to be executed**

<, > are redirection characters

***>outputFile* - send the output of the previous command (that is on the left of '>') to a file (*outputFile*) and not on the screen**

<inputFile* - the command (*doAction)* takes as input data stored in the *inputFile

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **Exercise**
  - **Open the MS Windows Command Prompt Interface**
  - **Type in the following commands (one by one)**

cd cd	*Changing the directory to c folder*
dir	*Shows the available files and folders in the current directory*
echo Hello!	*Repeat the typed text to the screen*
md (yourname)	*Create your own directory called "???"*
echo Hello! >myfile.txt	*Save the text into myfile.txt*
md john	*Create your own directory called "john" (dir)*
copy myfile.txt john	*Copy one or more files to an alternate location*
rd john	*Delete "john" folder and any files in it*
dir | sort	*pipes output from "dir" command to "sort" command. The output from "sort" is sent to the screen*

NOTE: Be carefully what files you delete!

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **Similar commands can be executed using the Shell CLI provided by Unix**
- **The commands may have different format under different CLIs**
- **Exercises on Unix will be done in the lab session**

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **Advantages of CLI**
  - **Relatively simple commands can be connected together to perform more complex tasks and to achieve a very flexible range of results**
  - **Skilled users can perform many tasks faster by using CLI instead of GUI**
  - **Operations are often invoked one “level” away from the basic command. With GUI options appear in different menus and on various menu levels**

2.3 Types of User Interface

Command Line Interface (CLI) (cont)

- **Disadvantages of CLI**
  - **More difficult to learn to use CLI. Especially for non-technical persons**
  - **CLIs are unsuited to certain tasks, such as image and sound editing**
  - **Multitasking command line environments do not offer the possibility to view multiple things at once on one screen.**
    - multitasking = ability to run multiple programs/commands and/or multiple instances of a single program/command simultaneously

2.3 Types of User Interface

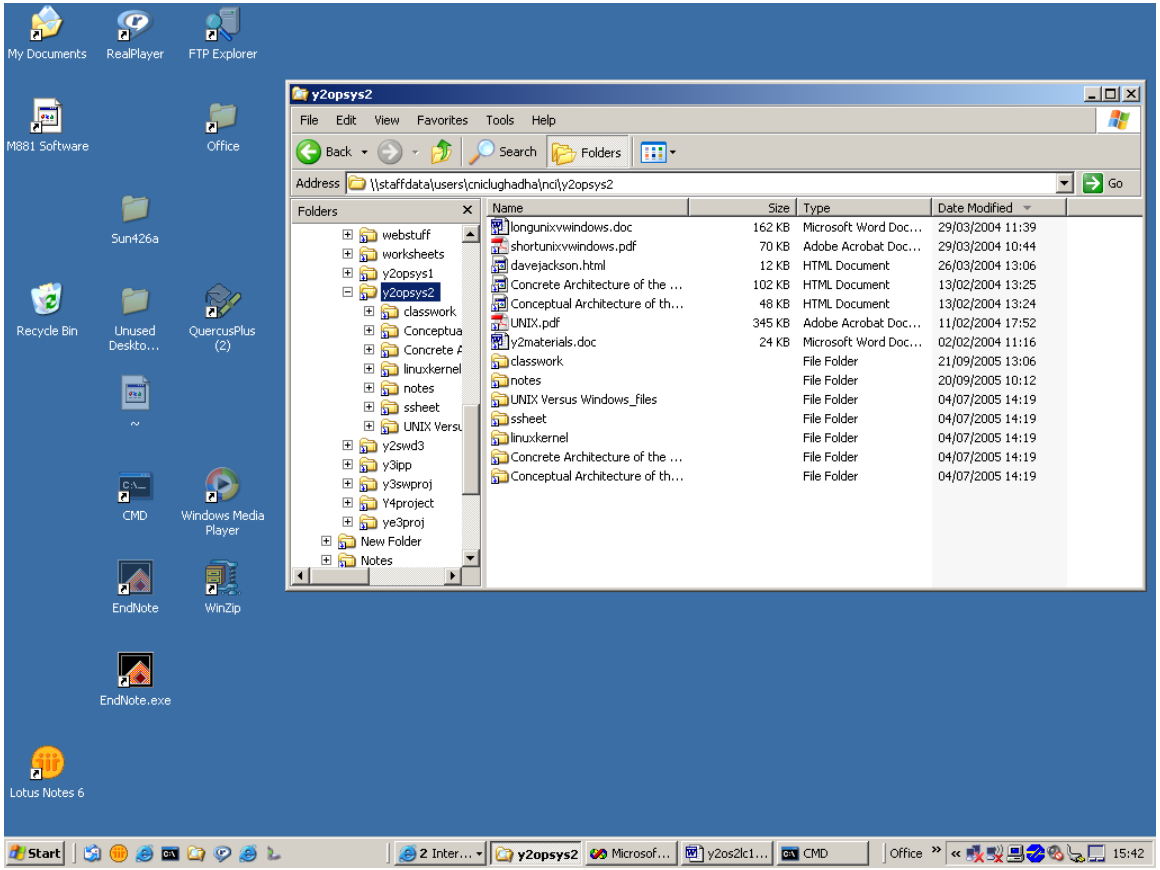
Graphical User Interface (GUI)

- **WordNet Dictionary Definition:**
  - ***"user interface based on graphics (icons and pictures and menus) instead of text; uses a mouse as well as a keyboard as an input device***
- **GUI :**
  - **accepts input via devices such as computer keyboard and mouse**
  - **provides graphical output on the computer monitor**
- **Macintosh has introduced the first GUI for personal computers in 1983 in Apple Computer's Lisa. Later on, Macintosh's GUI style inspired other PC manufacturers.**
- **In 1985 Microsoft introduced Windows, a GUI for MS-DOS–based computers**

2.3 Types of User Interface

Graphical User Interface (GUI) (cont.)

- **Example of GUI offered by Microsoft Windows**



2.3 Types of User Interface

Graphical User Interface (CLI) (cont)

- **Exercise**
  - **Open Windows Explorer within MS Windows operating system to visualise the structure of the folders on your computer**
  - **Visualise the files /folders located in the H directory (your home folder)**
  - **Create a file named “myfilewin.txt”**
  - **Create a folder named “johnwin”**
  - **Copy the “myfilewin.txt” file into “johnwin” folder**
  - **Delete the “myfilewin.txt” file within “johnwin” folder**

- **Which UI did you find being easier to use?**

2.3 Types of User Interface

Graphical User Interface (GUI) (cont.)

Currently, GUIs are used as:

- **operating-system interfaces**
  - **To select commands, work with the files, start programs, execute tasks**
  - **The mouse is used to point to pictorial symbols (icons) or lists of menu choices and to perform an action. No type in text commands.**
  - **Example: Mac OS, Microsoft Windows, X Windows System**
- **Web-based user interfaces**
  - **provide as output web pages transported via the Internet and visualised with a Web browser application**
- **application specific interfaces**
  - **touch-screen GUIs for applications such as: airline self check-in, information kiosks**
- **3D GUI**
  - **common in science fiction movies (e.g.Jurassic Park)**
  - **currently used in computer games, art and computer aided design**

2.3 Types of User Interface

Graphical User Interface (GUI) (cont.)

- **Advantages of GUIs**
  - **make computer operation more intuitive, and easier to learn and use**
    - drag-and-drop a file using mouse vs command(s) based task
  - **provide users with immediate, visual feedback on the effect of an action (e.g. delete file)**
  - **allow users to take full advantage of the powerful multitasking capability offered by the modern OSs**
    - multitasking = ability to run multiple programs and/or multiple instances of a single program simultaneously

- **Disadvantages of GUIs**
  - **intensive use of the processor's power in order to display the graphic elements or to perform multitasking operations**
  - **More complex to develop a GUI**

2.3 Types of User Interface

Batch Interface (Job Control Interface)

- **Batch Interface (BI) = non-interactive user interface.**
- **How BI works?**
  - **The user specifies all the details (e.g. commands) for a batch job => batch file**
  - **A batch system processes the batch file**
  - **The output is provided when all the processing is done**
  - **The computer does not require input data after the processing has started.**

- **Batch File = a file that contains a sequence of systems commands for performing a particular task**

2.3 Types of User Interface

Application Programming Interface (API)

- ***API*** **= A language used by an application program (developed by a programmer) to communicate with the operating system or other control programs (e.g. database management systems, communications protocol)**
- **APIs exist for operating systems, file systems, database systems, networking systems, etc.**
- **Most operating systems make API available to the programmers to invoke system calls within a program**
  - **E.g. open/close a file, release a block of memory, get the system's date and time**
  - **Windows NT provides an API called WIN32 API that is the official OS interface to all Microsoft Operating Systems.**

2.4 Categories of people that may interact with an UI

- **1. Programmer**
  - **A person that produces a software for himself or for others**
  - ***Application programmer* produces programs for *"Users".* E.g. databases, spreadsheets, word processors, mortgage repayment calculators,**
  - ***Systems programmer* produces low level software (E.g. Operating Systems, Compilers)**
  - **Systems programmer uses system calls via the API to make requests directly to the Operating System.**

2.4 Categories of people that may interact with an UI

- **2. Operational User**
  - **A person responsible for providing PC/system related facilities to the others.**
    - E.g. Operators, Network administrators
  - **Needs wide ranging access to the system resources in order to perform various tasks (e.g. delete/move files, adjust process priorities)**

2.4 Categories of people that may interact with an UI

- **3. End-User**
  - **A person for whom a hardware or software product is designed**
  - **The term "*end-user*" makes the differentiation between the user for which the product is designed, and the other users (e,g, designers, developers, installers) who are making the product possible for the end-user**
  - **The end-user may use a hardware or software product to solve a problem, produce a document, record some data, etc.**
  - **The end-user may or may not need extra skills**
    - E.g. ATM user vs. Legal Secretary using Word

NOTE: One person may at different times perform tasks within each of the categories!

Your Turn: Answer the Questions

- **1) Which class of user is each of the following?**
  - **Software engineer preparing her monthly expense claim in Excel**
  - **Parent configuring Internet Explorer on a home PC.**
  - **Student sending email to a friend**
  - **Accountant editing a .BAT file to schedule regular backups of his hard drive**

- **2) What type of user interface is used by each of the following?**
  - **Software engineer writing operating system extension**
  - **Computer Operator running batch jobs on a mainframe system**
  - **NT Administrator running batch jobs on Windows NT system**
  - **Student ordering books on Amazon.COM**
  - **Sales assistant scanning purchases at a supermarket checkout**
  - **Java programmer writing a program using Visual Studio**

Your Turn: Answer the Questions

- **Exercises**
  - **Give new examples (ie not from the Notes) of users doing a task and identify which type they are.**
  - **What type of user interface was the AERTEL system on RTE television? Explain.**
  - **What type of user interface is the TEXT system on SKY television? Explain.**
  - **What is meant by a GUI? What are its characteristics?**

Learning Outcome

- **After this lecture you should have an understanding of what a User Interface is and where it fits on our logical Operating System.**

- **You should know the following:**
  - **4 different type of User Interface and their characteristics, advantages and disadvantages**
  - **3 different classes of User and their distinguishing features**