User Interface Design
(Module-1)

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Definitions

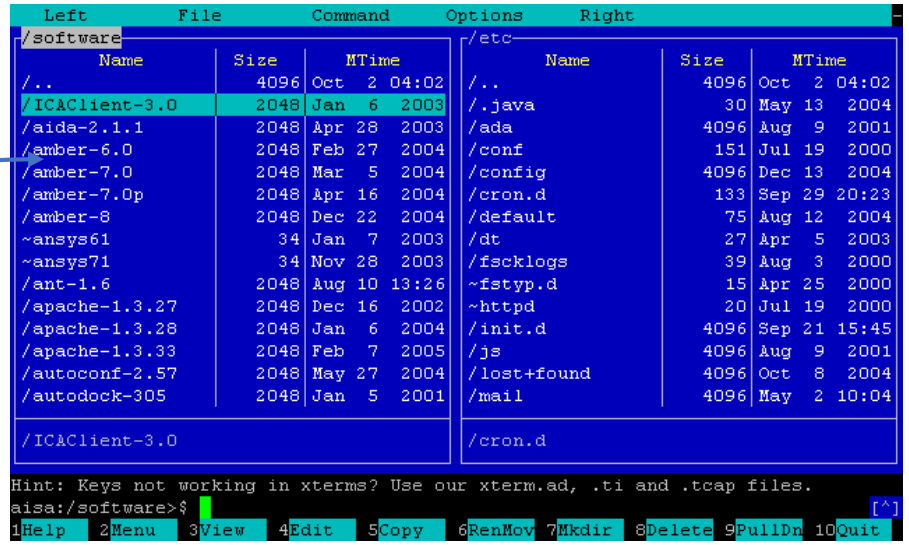
- **User interface design** is a subset of a field of study called human-computer interaction (HCI)
- **Human-computer interaction** is the study, planning, and design of how people and computers work together so that a person's needs are satisfied in the most effective way.
- The **user interface** is the part of electronic devices and its software that people can see, hear, touch, talk to, or otherwise understand or direct.

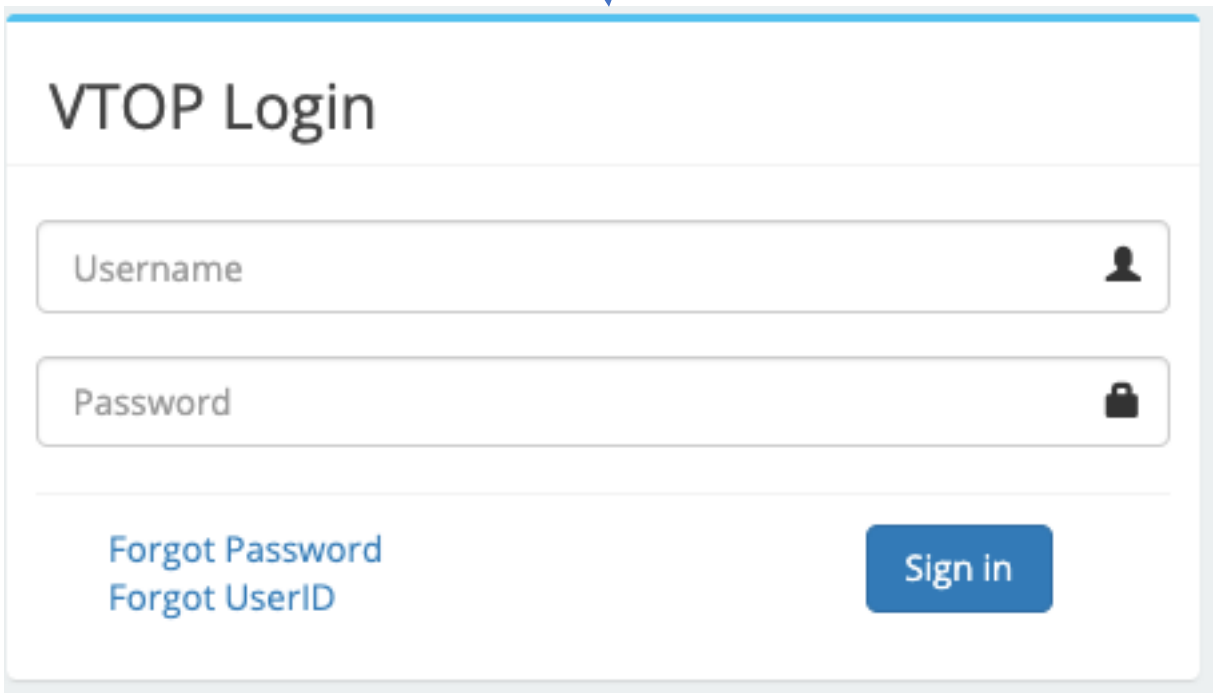
Components of UI

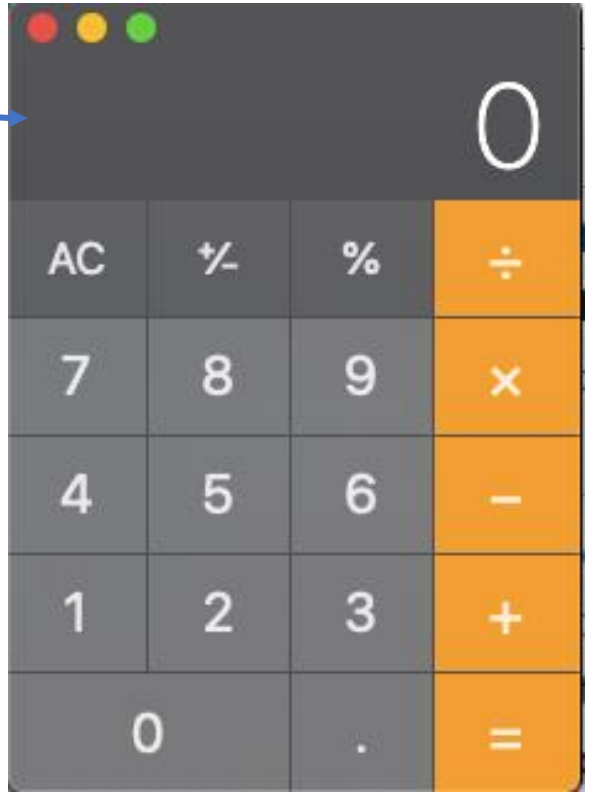
- The user interface has essentially two components: **input** and **output**. Input is how a person communicates his or her needs or desires to the computer.
- Input - keyboard, mouse, trackball, one's finger (for touch-sensitive screens or pads), and one's voice (for spoken instructions) .
- Output - how the computer conveys the results of its computations and requirements to the user. Today the most common computer output mechanism is the display screen,

Basic UI Types

- Text Based User Interface (TUI)
- Graphical User Interface (GUI)
- Web Interfaces







Characteristics of GUI and Web interfaces

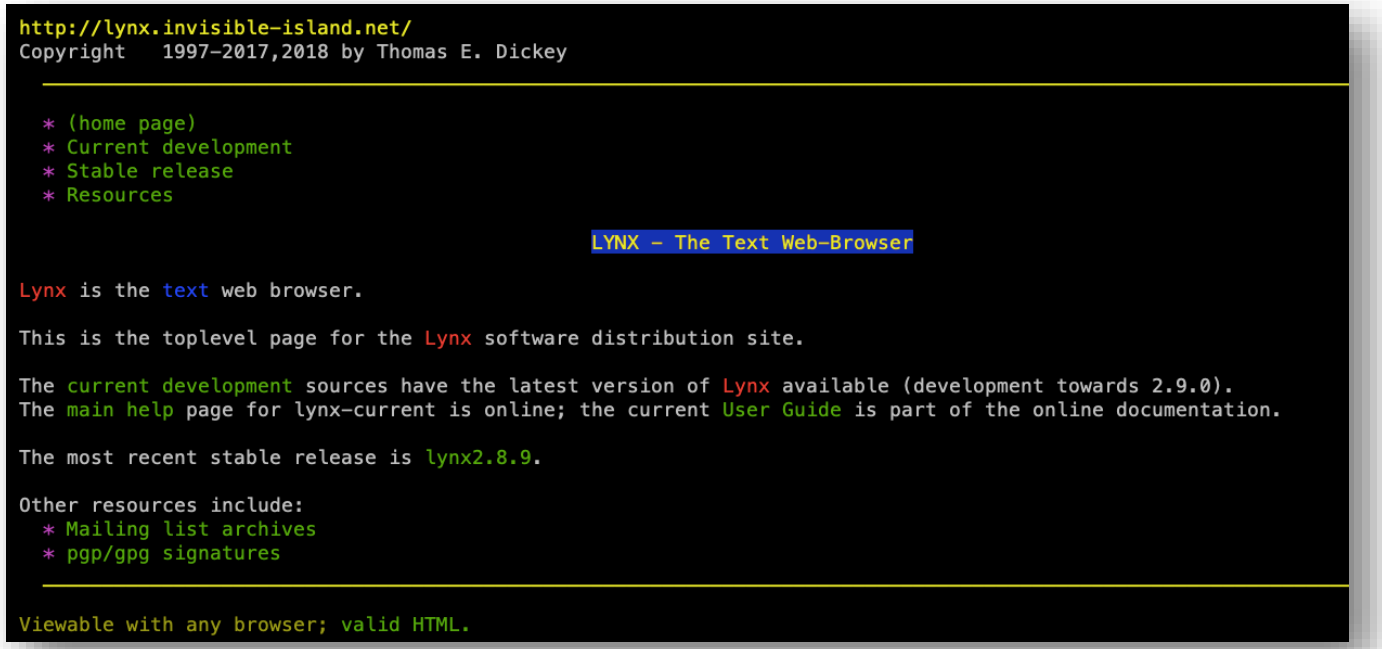
- Interaction styles.
- The concept of direct manipulation.
- The characteristics of graphical interfaces.
- The characteristics of Web interfaces.
- Web page versus Web application design.
- The general principles of user interface design.

Interaction Styles

- It is method, or methods, by which the user and a computer system communicate with one another.
  - Command line (function key or type a command into a designated entry area on a screen)
  - Menu selection (a set of options or choices from which a user must choose)
  - Form fill-in (useful for collecting information)
  - Direct manipulation (enables the user to directly interact with elements presented on the screen)
  - Anthropomorphic (the study of human societies and cultures and their development - interface tries to interact with people the same way people interact with each other. include spoken natural language dialogues, hand gestures, facial expressions, and eye movements)

Command Line
TUI Demo: Lynx Web Browser

- The Lynx web browser is a text-only browser originally developed by the University of Kansas in 1995.
- It is available as free open source software that runs on both Windows, Linux and the Mac.
- Lynx Basic Key Shortcuts
  - g or lynx URL – Open URL
  - ? – Help
  - Ctrl+R – Reload Page
  - Space – Next Page
  - Q - Quit



Class Activity

- **Compare and contrast Lynx with your favorite web browser.**
- Mention minimum five reasons.

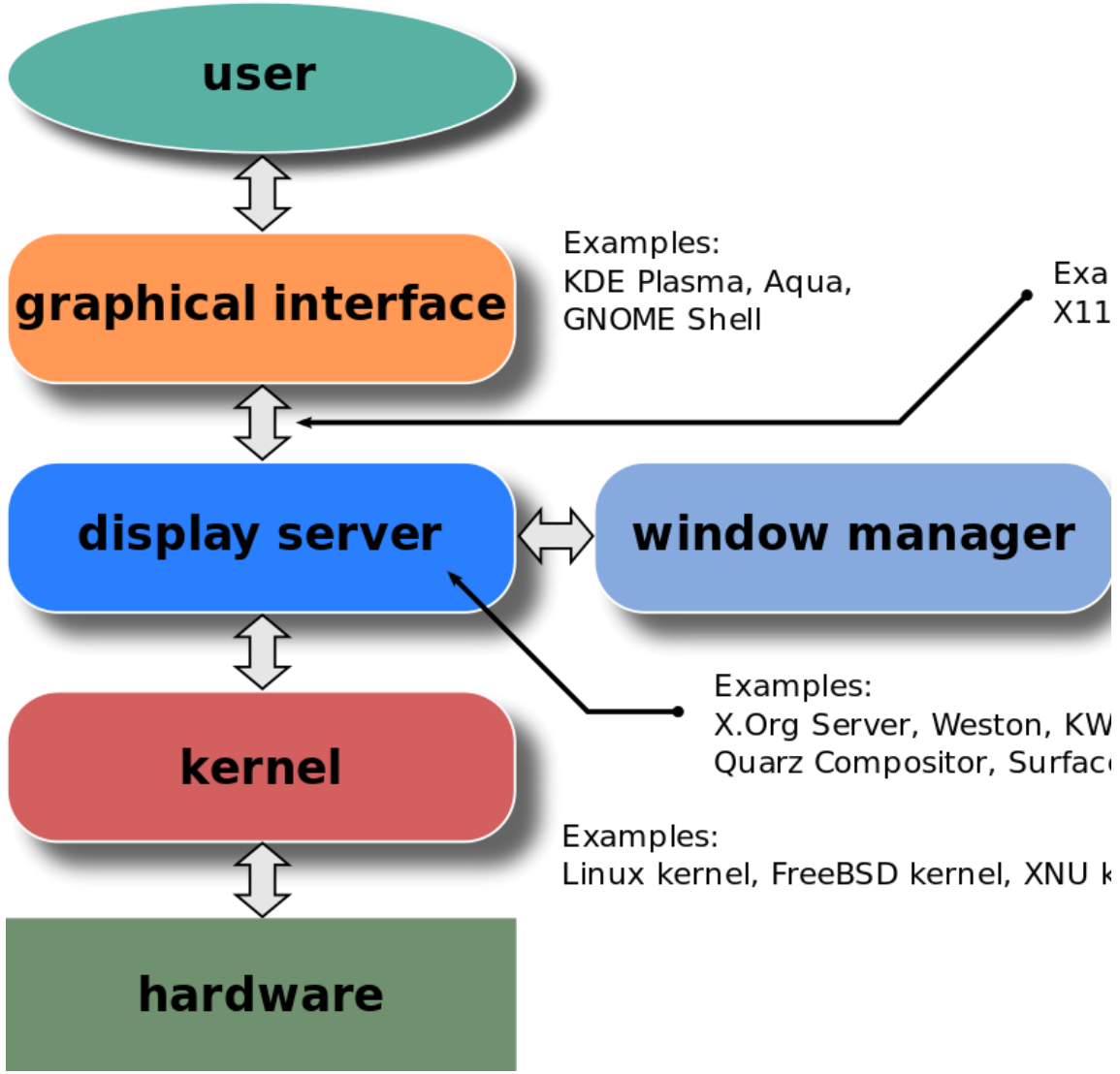
Instructions

- Enable your web Camera (Audio can be muted).
- Go to https://moovit.vit.ac.in
- Access CSI1005 Course Page and Start the Activity
  (Name: **01_20_07_2020_Understanding_TUI**)

Activity Time : 10 Minutes

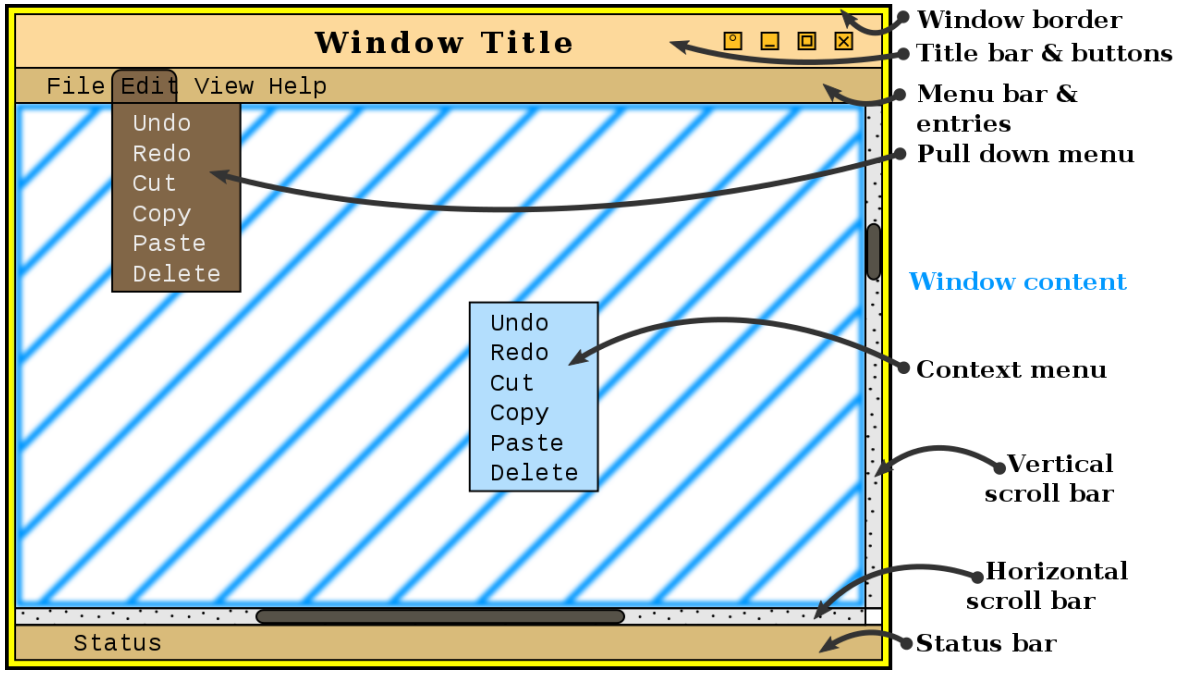
Graphical User Interface (GUI)

- A **user interface** is a collection of techniques and mechanisms to interact with electronic devices.
- In a **graphical** interface, the primary interaction mechanism is a pointing device of some kind. This device is the electronic equivalent to the human hand.
- What the user interacts with is a collection of elements referred to as **objects**. They can be seen, heard, touched, or otherwise perceived. Objects are always visible to the user and are used to perform tasks.
- People perform operations, called **actions**, on objects



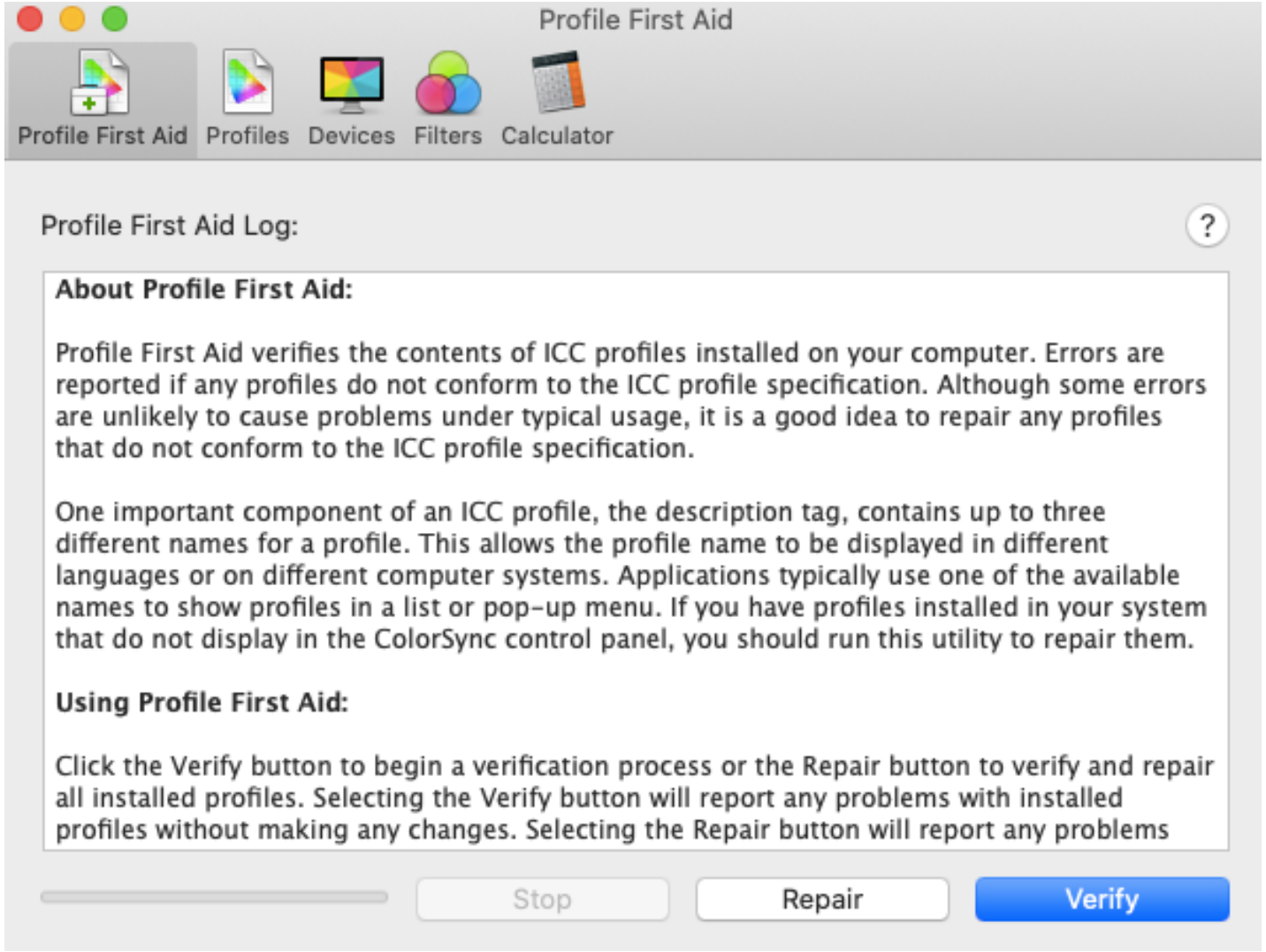
Properties of Graphics

- Graphic screens assumed a **three-dimensional** look.
- Information floated in **windows**, small rectangular boxes that seemed to rise above the background plane. Windows could also **float above other windows**
- Information could **appear and disappear** as needed
- Text could be replaced by graphical images called **icons**. These icons could represent objects or actions.
- Screen navigation and commands are executed through menu bars and pull-down **menus**. Menus “pop up” on the screen.



Graphical user interface elements (WIMP)

WIMP stands for "**windows, icons, menus, pointer** "



Evolution of GUI in Ubuntu

https://en.wikipedia.org/wiki/Ubuntu_version_history

The concept of direct manipulation

- First used by Shneiderman (1982)
- Enables the user to directly interact with elements presented on the screen. These elements (called objects) replace the keyed entry of commands and menus.
- Users typically select screen objects and actions by using pointing mechanisms, such as the mouse or joystick or touch, instead of the traditional keyboard.

Characteristics of Direct Manipulation

- The system is portrayed as an extension of the real world.
- Objects and actions are continuously visible.
- Actions are rapid and incremental with visible display of results
- Incremental actions are easily reversible.

Indirect Manipulation ?

Advantages of GUI

- **Symbols recognized faster than text**.
- **Faster learning and Easier remembering**.
- **More natural and Fewer errors**.
- **More attractive and May consume less space**.
- **Increased feeling of control**.
- **Replaces national languages**.
- **Low typing requirements**.
- **Smooth transition from command language system**.

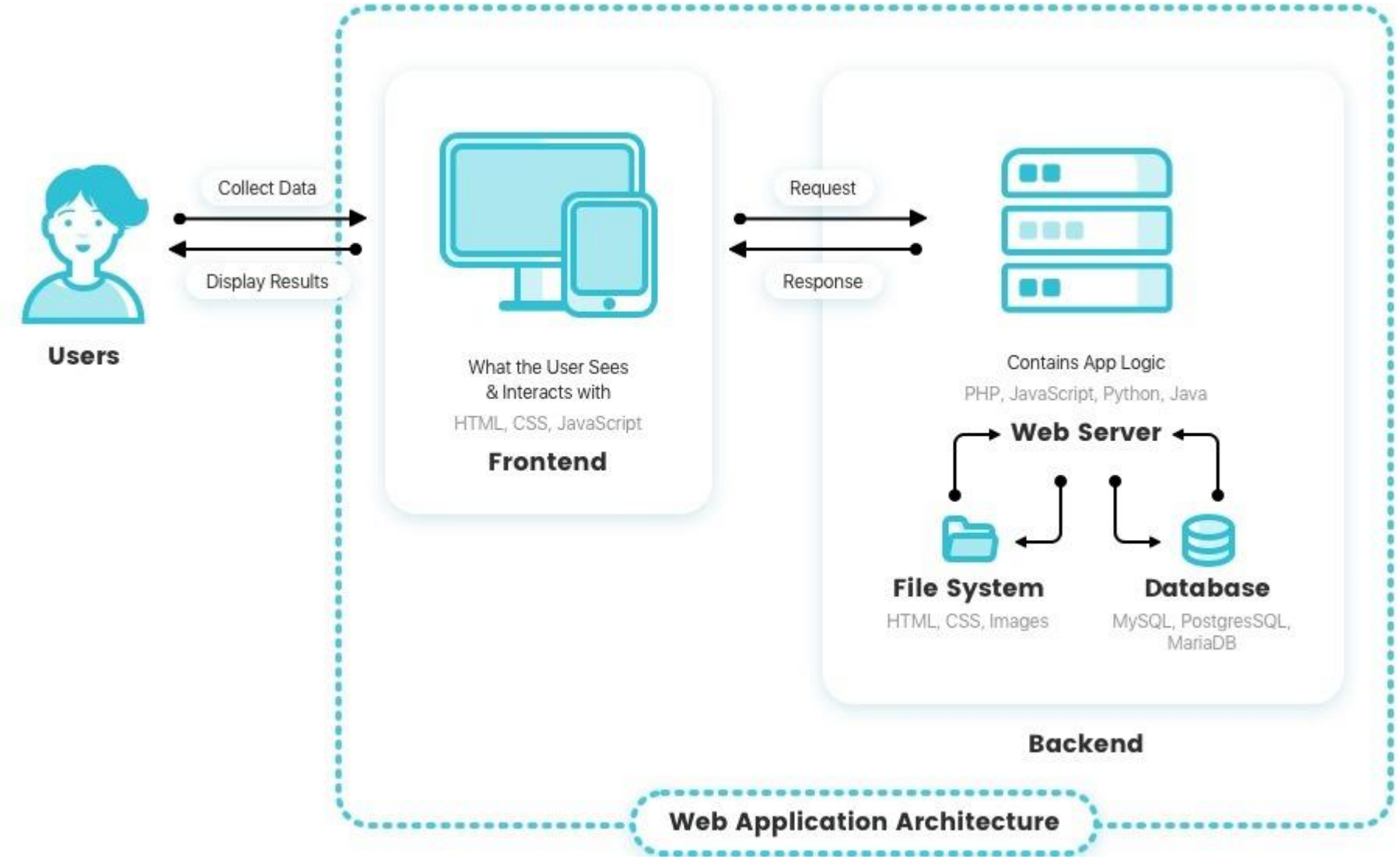
Disadvantage of GUI

- **Greater design complexity**.
- **Learning still necessary**.
- **Inconsistencies in technique and terminology**.
- **Inefficient for expert users**.
- **Hardware limitations**.

Web User Interface (WUI)

- The interaction between a user and software running on a Web server.
- The user interface is the Web browser and the Web page it downloaded and rendered.

Web Architecture



Characteristics or General Principles (GUI and WUI)

- Accessibility
- Availability
- Clarity
- Compatibility
- Configurability
- Consistency
- Control
- Efficiency
- Flexibility
- Responsiveness

General Principles for GUI and WUI

- ***Accessibility -*** *Systems should be designed to be usable, without modification, by as many people as possible.*
  - *Four characteristics of accessible design are* ***perceptibility, operability, implicity, and forgiveness****.*
  - ***Perceptibility*** *assures that a system's design can be perceived, regardless of a person's sensory abilities.*
  - ***Operability*** *assures that a system's design can be used, regardless of a person's physical abilities.*
  - ***Simplicity*** *assures that all users can easily understand and use the system, regardless of experience, literacy, or concentration level.*
  - ***Forgiveness*** *assures that a system minimizes the occurrence of, and consequences of, errors.*
- ***Availability -*** *All aspects of a system should be available at any time and in any sequence. (GUI vs WUI)*
- ***Clarity -*** *The interface should be visually, conceptually, and linguistically clear including:* ***Visual elements and Words and text***

General Principles for GUI and WUI

- ***Compatibility***
  - ***User compatibility -*** *"Know the user" is the fundamental principle in interface design. User compatibility can happen only if understanding truly occurs*
  - ***Task and job compatibility -*** *The structure and flow of functions should permit easy transition between tasks. The user must never be forced to navigate between applications or many screens to complete routine daily tasks.*
  - ***Product compatibility -*** *Compatibility across products must always be considered in relation to improving interfaces, making new systems compatible with existing systems will take advantage of what users already know and reduce the necessity for new learning*
- ***Configurability -*** *Permit easy personalization, configuration, and reconfiguration of settings to the following:*
  - *Enhance a sense of control.*
  - *Encourage an active role in understanding.*

General Principles for GUI and WUI

Consistency

- *A system should look, act, and operate the same throughout. Similar components should:*
  - *Have a similar look.*
  - *Have similar uses.*
  - *Operate similarly.*
- *The same action should always yield the same result.*
- *The function of elements should not change.*
- *The position of standard elements should not change.*

General Principles for GUI and WUI

Control

- The user must control the interaction.
  - Actions should result from explicit user requests.
  - Actions should be performed quickly.
  - Actions should be capable of interruption or termination.
  - The user should never be interrupted for errors.
- The context maintained must be from the perspective of the user.
- The means to achieve goals should be flexible and compatible with the user's skills, experiences, habits, and preferences.
- Permit the user to customize aspects of the interface, while always providing a proper set of defaults

General Principles for GUI and WUI

Efficiency

- *Minimize eye and hand movements, and other control actions.*
  - *Transitions between various system controls should flow easily and freely.*
  - *Navigation paths should be as short as possible.*
  - *Eye movement through a screen should be obvious and sequential*
- *Avoid frequent transitions between input devices such as the keyboard and mouse.*
- *Do not require the user to search for and gather necessary information and tools.*

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General Principles for GUI and WUI

Flexibility

- A system must be sensitive to the differing needs of its users, enabling a level and type of performance based upon:
  - Each user's knowledge and skills.
  - Each user's experience.
  - Each user's personal preference.
  - Each user's habits.
  - The conditions at that moment.

Responsiveness

- *The system must rapidly respond to the user's requests.*
- *Provide immediate acknowledgment for all user actions:*
  - *Visual.*
  - *Textual.*
  - *Auditory*

Recent Trends in Web User Interface (WUI)

- Single Page Application (SPA)
- Multi Page Application (MPA)
- Responsive Design (Adaptive)
- Dynamic Websites (Eg. Social Media)
- Dynamic Response (Eg. AJAX)

References

- Galitz, Wilbert O. *The essential guide to user interface design: an introduction to GUI design principles and techniques*. John Wiley & Sons, 2007.
- Wikipedia: The free encyclopedia. (2004, July 22). FL: Wikimedia Foundation, Inc. Retrieved July, 2020, from https://www.wikipedia.org
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