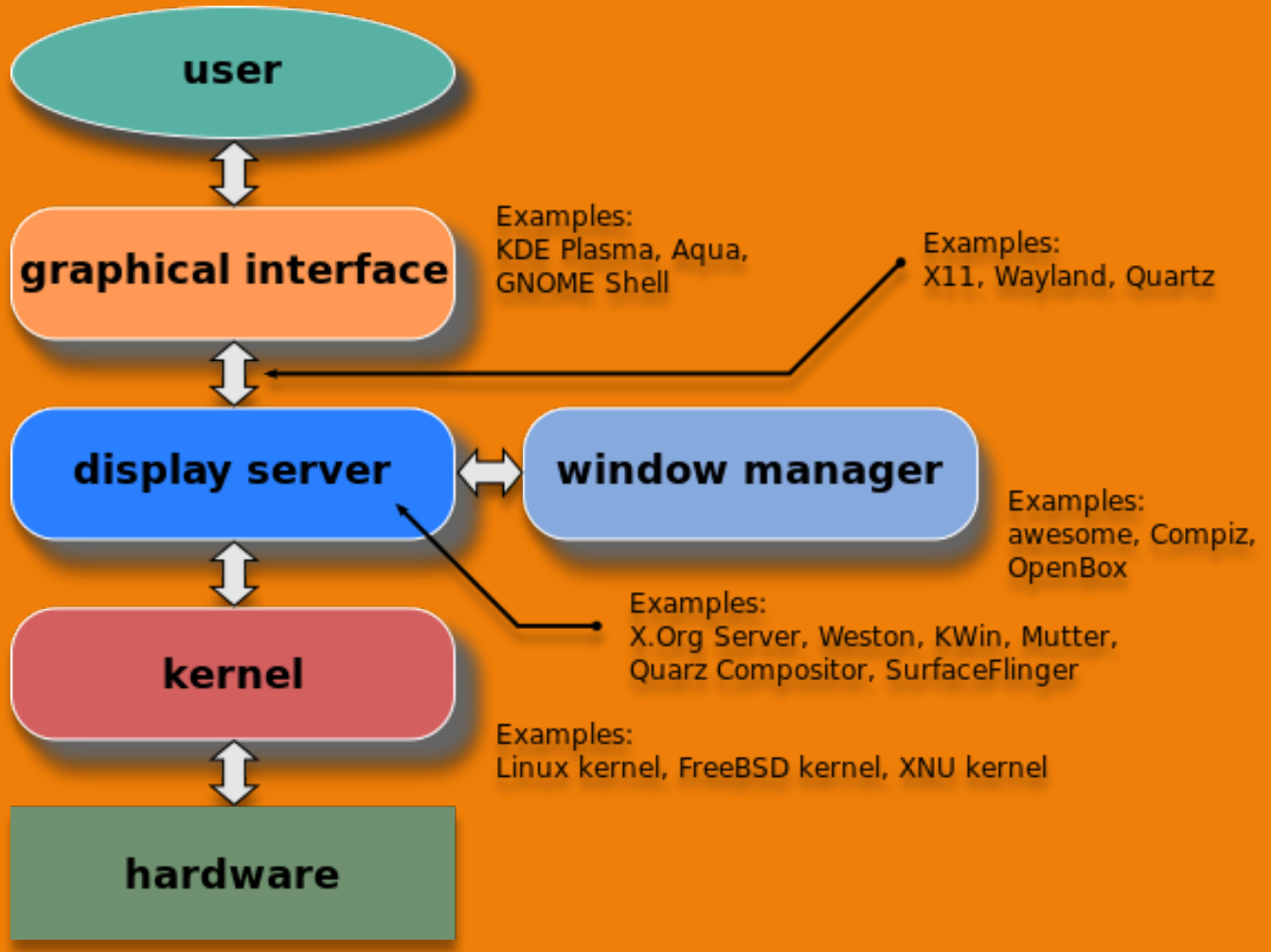
Linux GUI Explained

Why every Linux desktop install looks different?

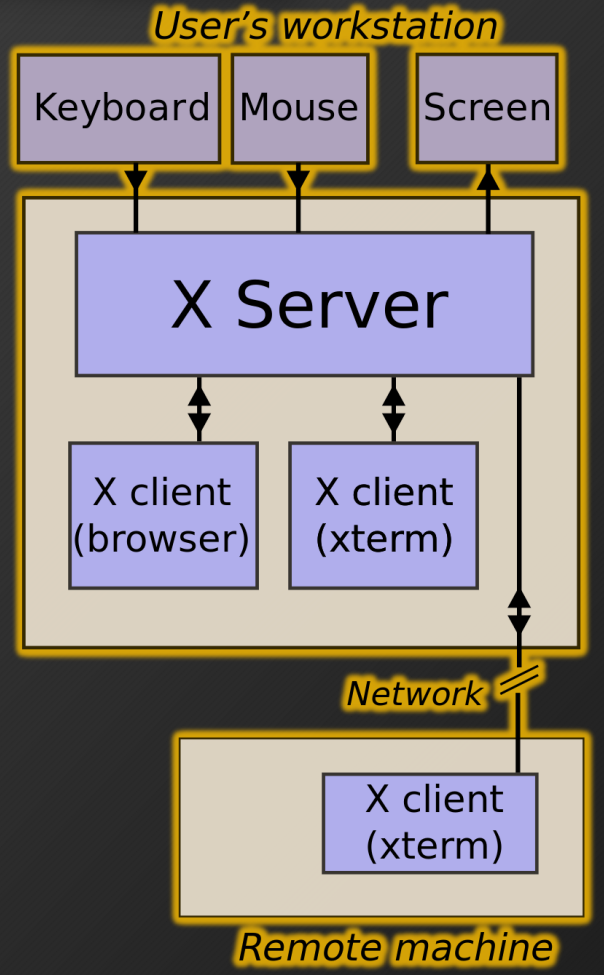
Graphical User Interface Stack

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



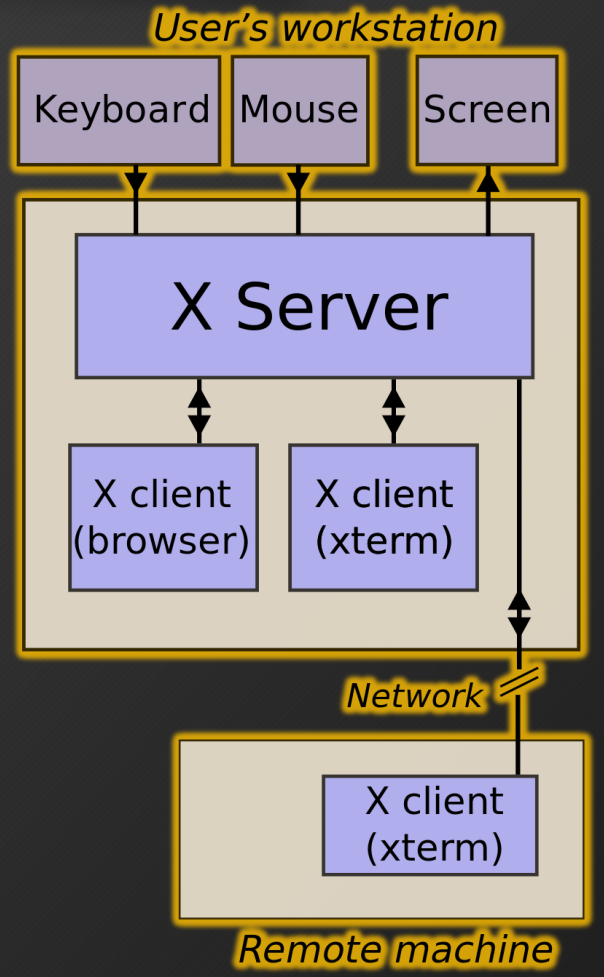
Display Server (Windowing System)

- Also called a "Windowing System"
  - Communicates with the kernel (therefore kernel/OS specific)
  - Applications are "clients" (some can even be remote)
    - Applications talk to the server using a "protocol"
- Provide the basic framework for other parts of the GUI
  - Output text or graphics
  - Handle Inputs and interactions (mouse and keyboard, events)
- Examples of Windowing Systems:
  - Xorg (X server)
  - SurfaceFlinger (used in Google Android)
  - Quartz Compositor (Apple for MacOS)
  - Wayland Compositors (implementations: Weston, Lipstick, Enlightenment, etc…)
  - Mir (by Canonical Ltd.)



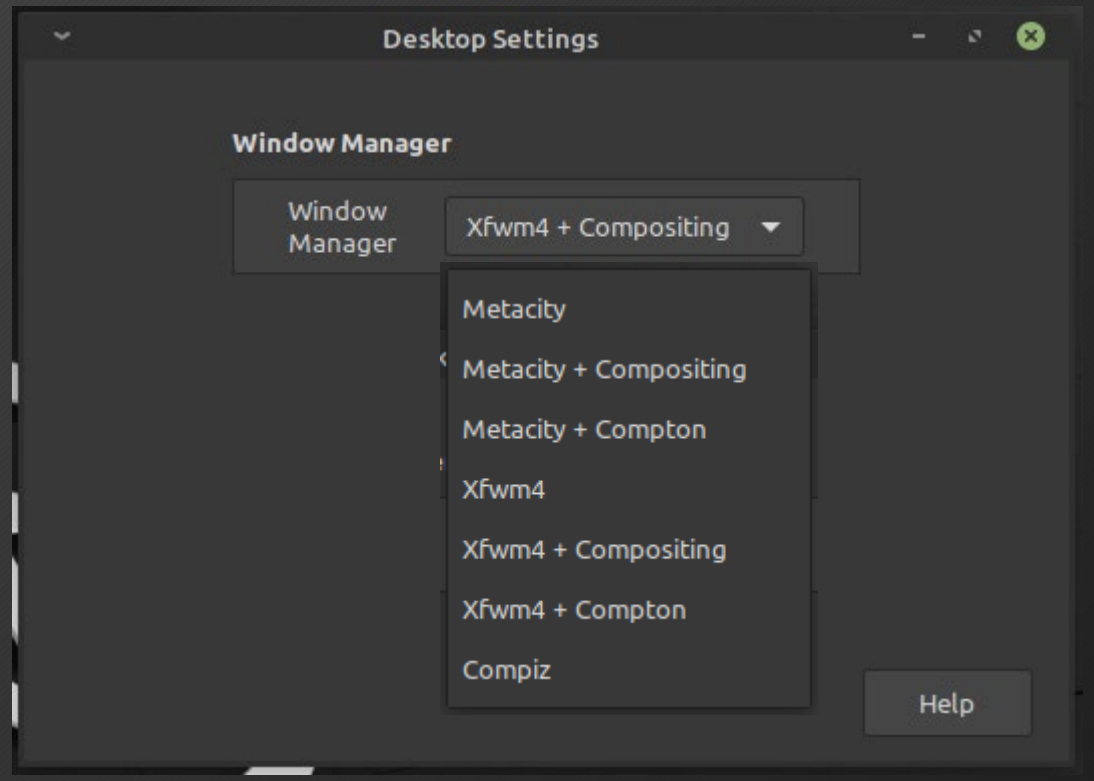
Display Server (Windowing System) Protocols

- Display Server communicates with its clients over a protocol
- Can be Network Enabled
  - Terminal servers are enabled this way
- Examples Windowing System Protocols:
  - X11 protocol (Xorg)
  - Wayland (Any of the “Wayland Compositors”)
  - Mir (Mir)
    - Developed by Canonical for Ubuntu, but dropped in favor of Weston/Wayland in 2017, then Wayland was dropped for X.org due to issues since 18.04 LTS



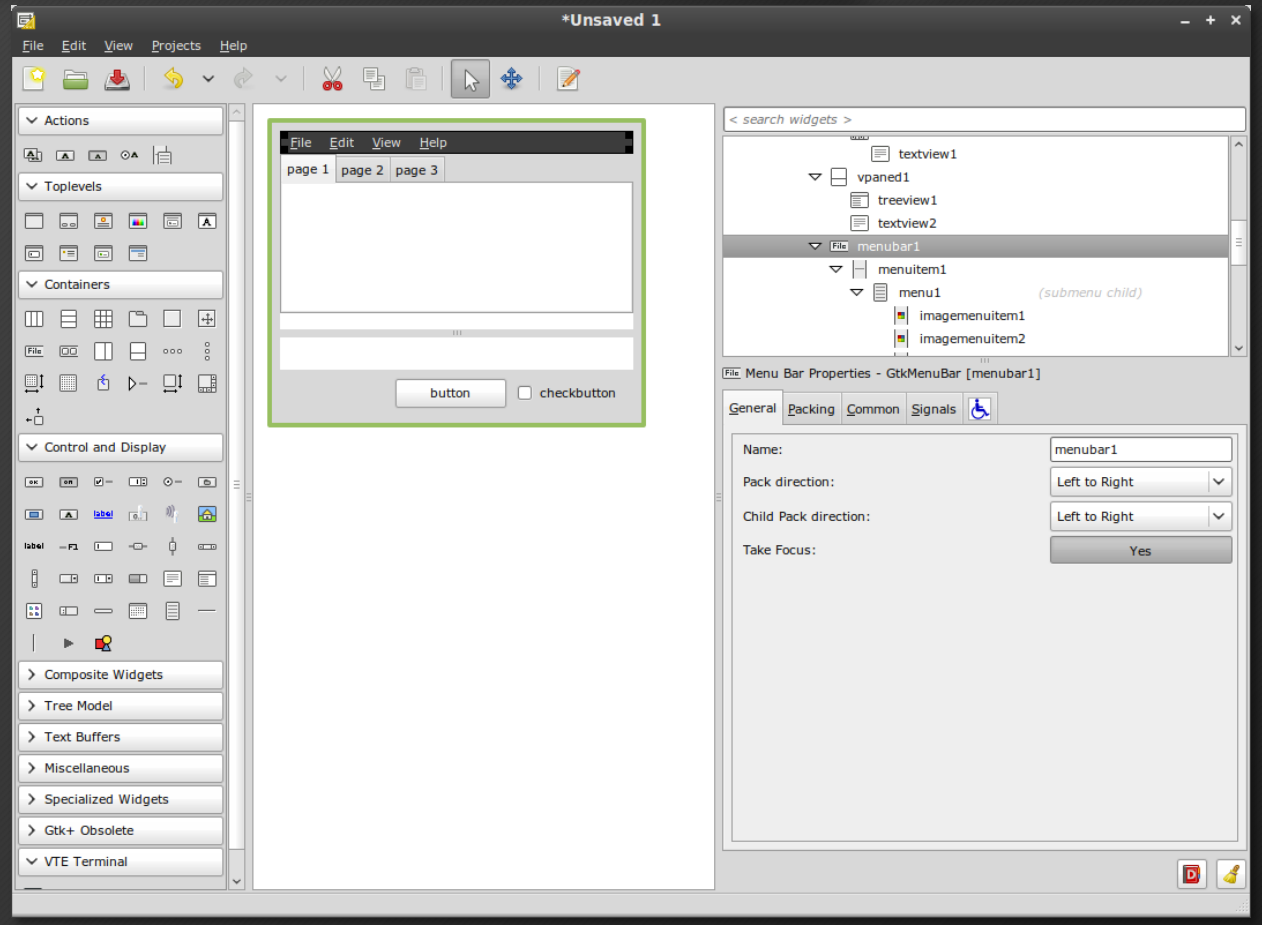
Window Manager

- Controls the way windows appear
  - Size and placement
  - Close, maximize, minimize buttons
  - Menus (File, View, … etc)
- Window Decorations
  - Usable part of the window frame
  - The box surrounding an application
- Must be compatible with Windowing system Protocol (Display server)
- Examples: Mutter, Metacity, KWin, IceWM, Xfwm, Compiz, etc



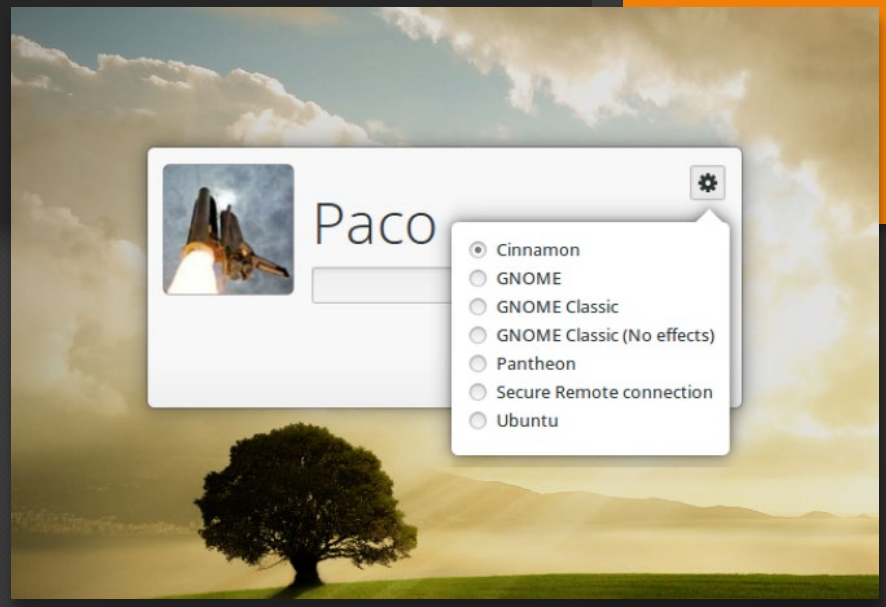
Widget Toolkit

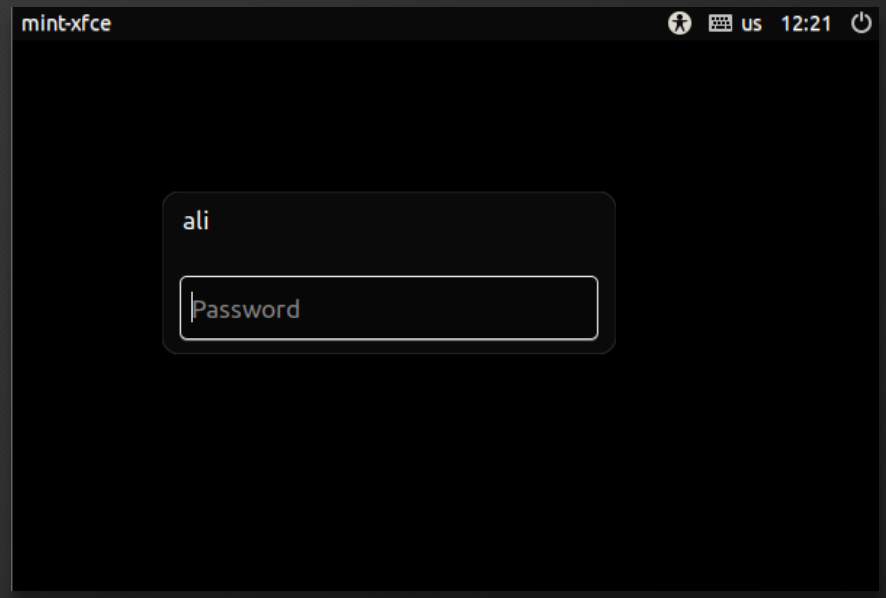
- Software library used to design appearance of windows, and other UI elements
- Customizing look of your desktop, or applications
- Applications can have customized code as well, overriding system/user settings
- Examples: GTK, Qt, SDL, AWT, Motif, Glade, etc…



Display Manager

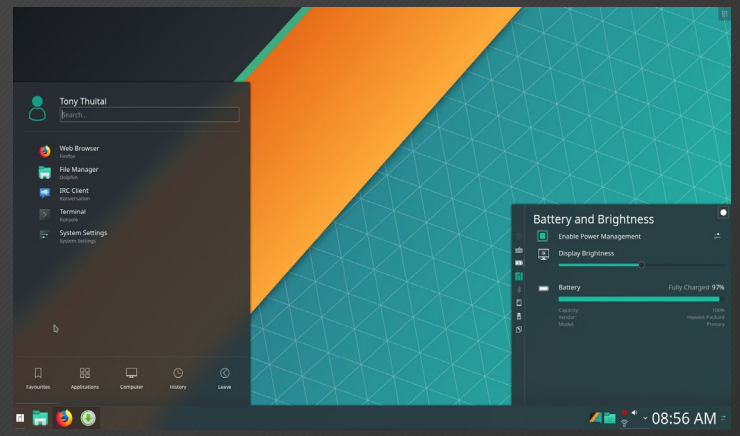
- Usually loads as “Login Screen”
- Allows user to load different Desktop Environments that may be installed on the system
  - More than one Desktop environment can be installed at the same time
  - User can select Desktop Environment from “Login Screen”
- Some allow standard-compliance for varying login methods such as LDAB, Biometric, etc…
- Examples: LightDM, GDM3, SDDM, LXDM, etc…

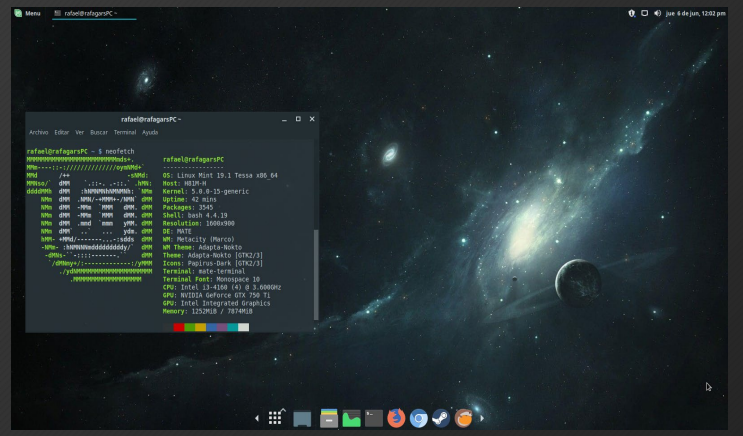


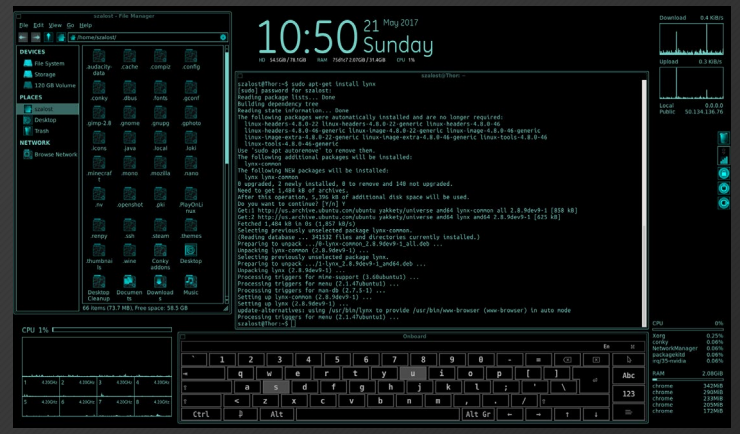


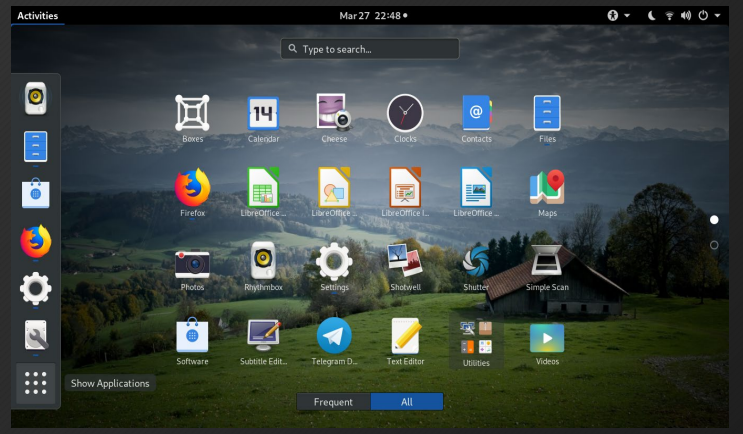
Desktop Environment

- Collection of software that provides a (semi)standard look and feel
- Bundle of various GUI components
- Examples:
  - KDE
  - Gnome
  - MATE
  - XFCE
  - LXDE
  - Cinnamon
  - Many, many more









Administrators' Notes

- You can pick and choose whatever combination of GUI components that work best for you and your users
  - Familiar look and feel, and least learning curve
- You can have multiple Desktop Environments installed
  - For example user may use LXDE while on battery and switch to Compiz/KDE (for eye-candy) when plugged in
  - Maybe one DE for Mac users and one for Windows users customized to make the experience seem more familiar
- No two Linux installations may look the same!
  - This is where "Open" and "Free" can become potentially problematic!
  - Most Administration, troubleshooting, and configuration may be still carried from CLI
- What to do to admin a Desktop Environment:
  - Know what Windowing System, Window Manager, and Display managers are in use, then refer to documentation of each for configuration, customizations, and troubleshooting