H.T. March 2013

Window Display Servers:- W, X, Wayland, SurfaceFlinger, Mir......

"many are called, but few chosen."

I remember when I was a young whipper-snapper, a wise and wizened Unix Wizard, once told me,
"**A Techo who uses a GUI is a WIMPY** (Windows, Icons, Menus & Pointer Yobbo).
Real Geeks always use a CLI"

The X Window System

The X originated at the Massachusetts Institute of Technology (MIT) in 1984. X11 was released in September 1987. X11R7.8 is due for release in 2013 and X12 is on the drawing board.

X has an ***asynchronous*** client-server architecture. X is the server, the user applications are the clients. This architecture is very useful in a multi-user, multi-hardware, networked environment. X server runs on the user's machine and can control & display multiple client applications that are running on the X server's hardware and/or on one or more remote machines (usually via ssh). This is called '***network transparency***'. The X server maintains control of the display and servicing of requirenents of the clients which includes directing keyboard and mouse events to the client of the ***focus window***.

X has a hierical structure, it has one ***root*** (parent) window; the child windows of the root window are called ***top-level windows***.

The Window Manager is the "other half" of X; outputs from the clients are routed by X to the Window Manager for compositing and are then returned to the X server for display. This separation facilitates the use of different third-party window managers. KWin is the KDE compositing window manager for X. Mutter is a compositing window manager used by GNOME 3. When a compositing Window Manager receives a new window from a client it creates a frame window and re-parents the application's window as a child of the frame, a title bar window is also placed within the frame. The frame and the title bar are called ***window decorations***.

A ***compositing*** window manager places each applications window in an off-screen memory buffer. It then composites these buffers into an into a frame buffer which is then passed to X for display. Compositing window managers may perform additional processing on buffered windows, applying 2D and 3D animated effects such as blending, fading, scaling, rotation, duplication, bending and contortion, shuffling, blurring, redirecting applications, and translating windows into one of a number of displays and virtual desktops

Some Example Window Managers for X.

Stacking window managers	Enlightenment, Fluxbox, Window Maker
Tiling window managers	awesome. Ion. ratpoison
Compositing window managers	Mutter, Xfwm, KWin
Virtual window managers	Tvtwm, HaZe, FVWM
Window managers that are extensible	Sawfish (lisp) , Xmonad (haskell)

Wayland

In recent years, Linux desktop graphics have moved from, a bunch of rendering interfaces (i.e. clients) all talking to the X server which has been at the 'centre of the universe', towards putting the Linux kernel back into the centre, with window systems like X and Wayland off to one side. Wayland is intended to be a simplified graphics system offering more flexibility and better performance.

Wayland rolls window management, compositing, and the display server into a single process
It enables compositing window managers to communicate directly with applications and video hardware. The applications are expected to communicate with input hardware using other libraries (not Wayland). Applications render graphics to their own buffers, and the Window Manager composites these buffers to form the on-screen display. This is proposed as a simpler and more

efficient approach.

?? Existing compositing window managers, such as KWin and Mutter are in the future expected to incorporate Wayland support and become Wayland compositors/display servers.

?? To provide backward compatibility and network transparency with it is intended that Wayland clients can be, traditional applications, X servers (rootless or perhaps fullscreen) or other display servers.

Weston is a minimal and fast reference implementation of the Wayland compositor and is suitable for selected embedded and mobile use.

Android does not have an Xserver it uses the '***SurfaceFlinger***' window manager/server. **Canonical** has announced (05/03/2013) their intention to move to "***Mir***" an in-house display server,

Some Display Server Terminology

API (Application Programming Interface) is a software protocol that enables applications to access library files.

DRI (Direct Rendering Interface) is a framework for allowing programs to speak directly to a graphics card. For example, games or graphics programs can send commands directly to a card and let it perform fast, hardware-accelerated rendering producing high-quality visuals. At the same time the CPU is free to do other work. This is known as ***direct rendering***. **DRM (Direct Rendering Manager)** is a component of the Direct Rendering Infrastructure. It consists of two in-kernel modules, one is a generic **drm** driver, and the other is a driver module intended to support a specific video device. This pair of drivers allows a userspace client direct access to the video hardware.

EDID (Extended Display Identification Data) is a data structure stored within a digital video display and provides its video source (e.g. graphics card or set-top box) with a description of the displays' capabilities. The EDID is stored in in ROM and can usually be read even if the display is turned off.

IPC (Inter-process communication) is a collection of methods (including APIs), which facilitates communication between different software processes.

KMS (Kernel Mode Setting) is a kernel module that can set the graphics card display mode. Prior to kernel 2.6.29 this was done by X and it was therefore not not possible to have fancy graphics until X had been booted.

OpenGL (Open Graphics Library) is a OS cross-language, multi-platform API for rendering 2D and 3D computer graphics. The API is typically used to interact with a GPU, to achieve hardware-accelerated rendering, The MS-Windows equivalent is DirectX.

VNC (Virtual Network Computing). is, a remote display system which allows you to view and control the desktop environment on a remote machine with a range of different of machine architectures. It is implemented in a client/ server model. This package provides a fully functional X server, to which a VNC viewer can connect. VNC can be optimised to work over slow network connections such as low-speed modem links so you can work remotely almost in real time in most environments.

Widget Toolkit is a library that provides widgets to programs via an API.

""So the last will be first, and the first will be last." Matthew 20:16

Q What is **W**?
A W is the 1983 synchronous **W**indow System, the precursor concept to X.