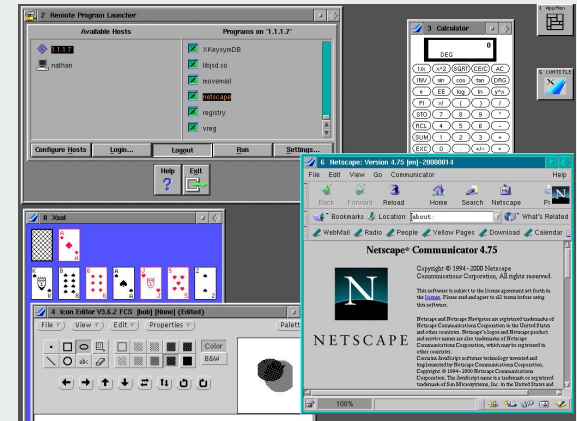
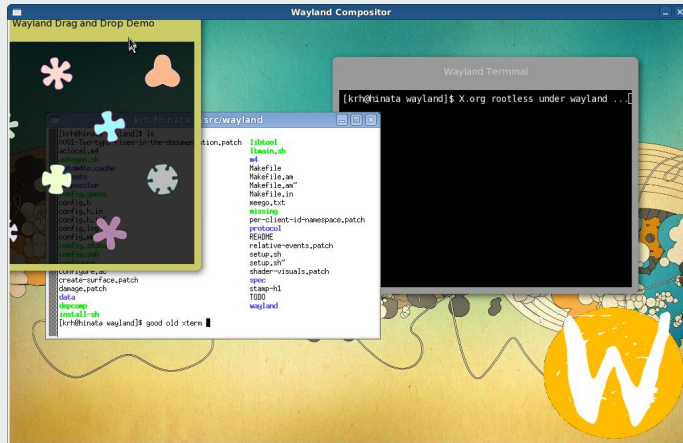
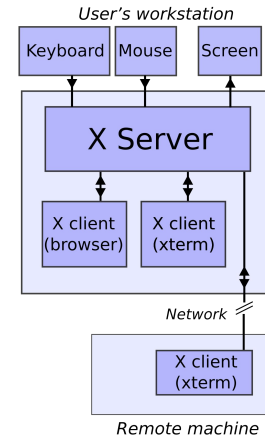


X11 (X) and Wayland

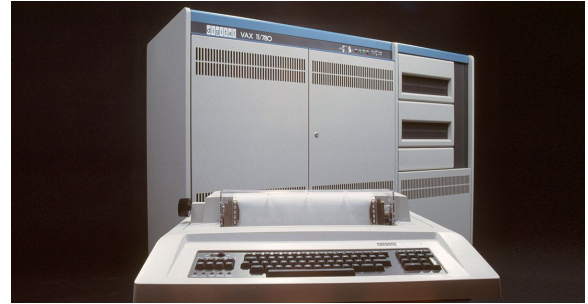


What is X?

- X, also known as X11 or the X Window System, is a windowing system designed to be hardware agnostic.
- X is an asynchronous windowing system, with its functionality being split between the X Server and X Client, which communicate with each other via the X Protocol.
- Open-Source under the MIT license.



A dram of ~~X~~ History



- The X Window System is named after the next letter of the alphabet from its predecessor, W, which was designed to run with the V operating system.
- Back in 1984, Project Athena was working on the Argus system and required a platform independent graphics system to link together their various machines that used different vendors (Such as digital's "minicomputer", the VAX 11/780.)
- To address this, X was born in May 1984 to allow machines to use the X Protocol to run local applications and also draw resources remotely. X was also the first window system to be wholly vendor and hardware independent.
- X went through many versions before being officially licenced under MIT on version X10R3, which is when it began to garner a much broader appeal from outside sources.
- After version 10, the development team decided X needed to steer more hardware neutral before being more widely distributed, which would have demanded a complete redesign that at the time was beyond MIT's resources. Thankfully, DEC's Western Software Laboratory had a seasoned group of people willing to collaborate with the project as long as the newest version of X was made under the same terms as X9 and X10.
- Development started May 1986 and ended in February 1987, creating X11.



Before we Continue: X's Terminology

- The client-server terminology in X can sometimes be confusing because it seems a tad backwards at first. The user's terminal acts as the server, while the applications are the clients. This twist is because X is designed from the application's perspective. The X server provides display and input/output services to applications, which makes it the server. The applications, in turn, request and use these services, making them the clients.



The X Server

- The X Server manages user input from a keyboard and mouse along with what the monitor needs to display.
- It also manages graphical resources like Font information, Pixmap (off-screen images) and color maps.
- The server gives the client its window, draws it to the screen and then waits for additional input.



The X Client(s)

- Applications, such as Firefox or a text-editor, are considered X Clients.
- These clients do not directly access any resources themselves, they send requests to the X Server through the X Protocol, which can be done locally or remotely.
- Clients can continue to send requests, such what to do after the server handles user input or draw additional information to the screen (Like when you type in a text editor or navigate to a webpage).

Numerous Linux/X11 Display Drivers Can No Longer Even Properly Build

Written by [Michael Larabel](#) in [X.Org](#) on 31 January 2022 at 05:00 AM EST. [42 Comments](#)

99 Problems and ~~X~~ Might be One

- As most of us know, X is still kicking to this day, touting its server-client setup even after its rounding the corner of being 40 years young.
- Its consistency is commendable, but X has a few issues with its old-school window management that affect the modern desktop experience.
- One of these issues, is the lack of built-in encryption between the X Client and Server.
- On top of that, X's server-client model nature of X11 contains a built-in bottleneck, as the X Server has to wait for X Clients to process each request before proceeding.
- Probably the issue most people are familiar with is X's relationship to graphics drivers, as they need them for every hardware configuration which can lead to a lot of compatibility issues.

Why is my NVIDIA driver loaded but not detected by X.org?

Asked 3 years, 4 months ago Modified 3 years, 4 months ago Viewed 558 times

<https://forums.developer.nvidia.com/t/x11-has-stopped-working-on-fedora-35/200682> ...

X11 has stopped working on fedora 35 - NVIDIA Developer Forums

It seems that the **x11 drivers** are not working with fedora 35 any more. Last working version was with

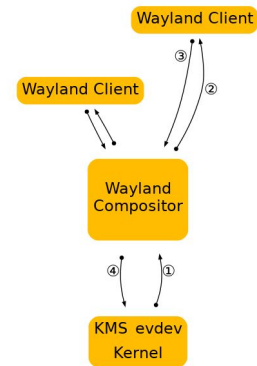
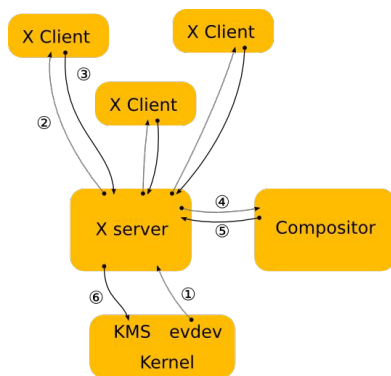


A Challenger to the Graphical Throne

- X's dominance remained unquestioned until another display server debuted its development in 2013, designed to be a direct replacement to X11.
- It was made to ditch the asynchronous model and focus on using modern techniques and processes.
- This new windowing system finally got a recent alpha release in January 2021 and is known as Wayland.

What is Wayland?

- Wayland is a display server protocol (Like X's X Protocol).
- It has removed the need for a server to manage lower level tasks as its compositor and application layers speak directly to one another without the need for a middle man.
- This allows rendering to occur client-side, which removes the usual overhead from a server and client needing to juggle various graphical events.



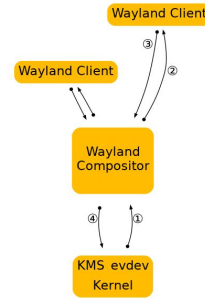


A Centimorgan of Wayland History

- One of the developers of X and an employee of Red Hat called Kristian Hogsberg, started working on a side project in 2008 that would allow the applications, or clients, have control over their own rendering.
- Most of the UNIX community was in support of Wayland except Canonical (Creators of Ubuntu). They were disappointed with Waylands progress at the time and decided to push for for another project, Mir, to take the reins so they could implement it in their current project, the Ubuntu Touch. This ended up not playing out, and Mir ended up going open source and being turned into a Wayland Compositor itself.



Wait, What's a Compositor?



- A compositor is a software component responsible for combining (or "compositing") the graphical elements of a display, such as application windows, desktop backgrounds, and graphical effects, into a single image that is rendered on the screen.
- It handles inputs and rendering all at once, so you only need the compositor itself to run your graphical tasks.
- Hyprrland and Sway are examples of Wayland compositors, taking the role as window managers, compositors and handling of user input all themselves.
- X also has compositors (Picom), but they run on top of the server, which adds additional overhead.





Vs. Wayland, Whos Better? (It's up to you!)

- X has been in the game for a long time, so a lot of graphical unix software was developed mainly for X.
- Is still the best option for remote desktop software (X forwarding over SSH is still pretty good).
- As of now, X has Wayland beat in the customization department due to its longevity
- Is more understood by the community.



- Wayland is a lot more efficient, with lower latency and smoother rendering.
- Better for monitors with higher Hz.
- Simplier design, no need to wrestle with extraneous components like a X Server.
- Being actively developed along with being supported by big players like GNOME and KDE.
- Runs a tighter ship when it comes to security via running clients in isolated environments with reduced permissions.





Works Cited

- DEV Community. "Beyond the Basics: In-Depth Look at Linux Display Servers, Window Managers, and Compositors," September 16, 2024. https://dev.to/sandheep_kumarpatro_1c48/beyond-the-basics-in-depth-look-at-linux-display-servers-window-managers-and-compositors-40bk.
- Front Page Linux. "Https://Frontpagelinux.Com/Articles/a-Deep-Dive-into-the-Wayland-Protocol-for-Linux/," April 2, 2022. <https://frontpagelinux.com/articles/a-deep-dive-into-the-wayland-protocol-for-linux/>.
- "Numerous Linux/X11 Display Drivers Can No Longer Even Properly Build." Accessed November 20, 2024. <https://www.phoronix.com/news/X.Org-Driver-Shambles-2022>.
- The History of X11*, 2024. <https://www.youtube.com/watch?v=R-N-fgKWYGU>.
- "Wayland." Accessed November 20, 2024. <https://wayland.freedesktop.org/architecture.html>.
- CBT Nuggets. "Wayland vs. Xorg: Will Wayland Replace Xorg?" Accessed November 20, 2024. <https://www.cbtnuggets.com/blog/technology/devops/wayland-vs-xorg-wayland-replace-xorg>.
- "What Is X11? | Baeldung on Linux," July 10, 2022. <https://www.baeldung.com/linux/x11>.
- Code, Linux. "Xorg vs Wayland: Comparing Linux Display Servers." TheLinuxCode, November 4, 2023. <https://thelinuxcode.com/xorg-vs-wayland/>.