

# Printing in Chrome OS

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Sean Kau (skau@chromium.org)

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# What is Chrome OS?

Personal computers. Laptops, Desktops,  
Convertibles, Tablets and All-in-ones.

Open Source, based on Linux, runs Android &  
Linux apps

Devices made by many different OEMs



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# Open Source

- Derivative of Gentoo. Everything\* is built from source via Portage by Google.
- Upstream first policy
  - Seek to land changes upstream over carrying patches
- ChromiumOS
  - <https://chromium.googlesource.com/> - chromiumos/\*
- Chromium
  - <https://chromium.googlesource.com/chromium/src>
- Google's contributions are BSD or GPL licensed

\*a small handful of drivers are not available as source

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# ChromeOS vs ChromiumOS

- ChromeOS is distributed as images by Google with OEMs
- Images are signed by Google and verified by the firmware
- ChromeOS includes features supported by Google infrastructure
  - Sync
  - Updates
  - Play Store
- ChromiumOS is the open source project, only available as source. Designed to be modifiable.

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# ChromeOS vs Other Linux Distributions

- Partitioning Scheme
- Code distribution
  - Google generates all images and executables
- Allowed programs
  - Users can't install arbitrary executables (outside of containers)
- Platform variety
  - armv7, armv8, x86\_64
  - clang + libc++
- User management
  - System locale never changes
  - UI handled by Chrome. User management handled by Chrome.
  - cryptohome (encrypted user home directories, user isolation)
- Security

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# Security

- Code inspection
- Fuzzing
  - Internal Fuzzers
  - OSS-Fuzz
- system daemons
  - user separation
  - least privilege
- minijail
  - seccomp-bpf (syscall filtering)
  - namespaces - process, network, mount

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# Printing Environment

- CUPS as IPP library and spooler
- Printer configurations stored in Chrome
  - Enables Sync
  - On-demand installation
  - Handle arbitrarily large set of printers
- Printer Discovery in Chrome
- OpenPrinting Projects
  - cups-filters
  - foomatic-rip
  - OpenPrinting PPDs
  - ippusbxd
- Ghostscript
- PPD index

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# Printer Discovery

- Chrome performs mDNS scans
- nss-mdns and avahi used for address resolution in CUPS
- Namespaces
  - `_print._sub._ipps._tcp`
  - `_print._sub._ipp._tcp`
  - `_ipps._tcp`
  - `_ipp._tcp`



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# PPD Index

- Consume PPDs from open source and proprietary sources
- Mapping values in PPDs to values we expect printers to use USB\_MFG and USB\_MDL fields or printer-make-and-model if the printer supports IPP
- Served from Google Infrastructure
- Some testing to perform smoke tests on the PPDs

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# Future Involvement

- Advocate for standards adoption
  - Eventual exit PPD distribution
- Provide editorial feedback for new standards
- Migration to Printer Applications
  - Better jails
- Bug fixes and enhancements to upstream projects