Replacing CONFIG_VT/linux-console

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What is CONFIG_VT?

- access control to graphics/input devices
- VT102 terminal emulator
- VGACON + FBCON
What is it used-for?

- session dispatcher
- lightweight UI with little hardware requirements
- emergency console
- kernel log (boot/shutdown-log, oops/panic-screen)
- backwards-compatibility
Linux-Console

- DEC “standards” VT100-VT520
- xterm de-facto standard
- more or less VT102 implementation
- lots of private extensions
Linux-Console Problems

- UI in kernel space
- poorly maintained
- bad keyboard handling
- bad font rendering
- missing modesetting/multihead support
- no multi-seat awareness
- limited hotplugging support
- limited to VT102
- blinking cursors
Solution?

- Move to user-space!
  - XKB, pango, OpenGL, ... limited to user-space
- reasons to keep the linux-console
  - oops/panic-screen
  - emergency-console
KMSCON

- started November 2011, improved during GSoC 2012
- terminal emulator in user-space, but can do a lot more

- libuterm
- TSM
- kmscon
KMSCON Features

- highly modular
- libxkbcommon, libudev, libpixman, glibc, (libdrm)
  - everything else is optional
- seat/device hotplug support
- per-seat/device configuration
- session-manager
- TSM: xterm-compatible terminal emulator state-machine
- XKB
- Unicode/Internationalization
- hardware-acceleration
Replacing `agetty`

- `systemctl start kmsconvt@tty1`
- `ln -s /lib/systemd/system/kmsconvt@.service /etc/systemd/system/autovt@.service`
- `starts getty@.service on failure`
Virtual Terminals

- access-control to input/graphics devices
  - hard to compare to audio (pulseaudio), v4l2, ...
- input devices provide grabs
- DRM devices provide DRM-Master logic
- accessed via /dev/tty<num>
- only one VT active at a time
- TEXT-MODE: controlled via read(), write(), ioctl()
- GRAPHICS-MODE: setup via ioctl(), otherwise mostly ignored
Problems with VTs

- ugly API
  - signal-based
  - unrelated to input/graphics devices
  - unmaintained
- dead VT $\Rightarrow$ dead system
- no VT_WHOAMI
  - fstat() to retrieve MINOR
- no multi-seat awareness

*Replacement required!*
What do we want?

- compositor: xserver, weston, directfb, ...
- emergency-console
- standalone applications (e.g., normal-console)
- legacy applications
- any combinations
- multi-seat awareness
- sane VT API
- unified environment across VTs
- forced VT-switches
- device revocation
Extending CONFIG_VT

- multi-seat awareness (/dev/seat_<seat>/tty<num>)
- sane VT-API (/sys/class/tty/tty0/active)
- forced VT-switches
- device-revocation (revoke() syscall)

- still kernel-code
- ugly code-base
- no unified environment
- maintainer?

- Move to DBus?
System-Compositor

- rudimentary & lightweight compositor
- fullscreen-only windows
- needs yet to be written
- multi-seat aware
- sane VT-API
- unified environment
- forced VT-switches
- device revocation
drmStealMaster()

- steals DRM-Master from current master
- notification via drmHandleEvent() (and EACCES)
- used solely for emergency

- systemctl isolate emergency.target
  - destroys environment
KMSCON Sessions

- session-manager controlled by global keyboard-shortcuts
- many session types
  - dummy/blank session
  - terminal-session
  - (wayland-session)
  - (dbus-sessions)
  - cdev-sessions

- implemented via CUSE (based on FUSE)
- supports full VT API
- one device per seat (/dev/ttyF<seat>)
- each open file of the cdev is a different VT
  - can still be passed via fork() or UNIX-sockets
- no replacement for CONFIG_VT
- only for backwards compatibility
  - CONFIG_VT for all seats!
fblog + drmlog

- boot/shutdown-log, oops/panic-screen
- kernel-log on all connected monitors
- on/off setting per connector via sysfs
- no eye-candy
- split-screen (width ≥ 8 * 80 * 2 = 1280)
- drmlog needs yet to be written (ongoing work)
- fblog-v3 available on linux-fbdev@vger.kernel.org
- kmscon-session available
High-Level Overview

- seat0 (CONFIG_VT=y)
  - CONFIG_VT is primary session-manager!
  - linux-console or kmscon as terminal-emulator on single VTs
  - compositors on single VTs
    - or: system-compositor on single VT
    - system-compositor is secondary session-manager
    - compositors as clients of system-compositor
$\textit{seat} \neq \textit{seat0} \text{ or } \text{CONFIG\_VT}=n$

- (single session mode)
- or: system-compositor
  - primary session manager
  - compositors as clients
  - kmscon as client
- or: kmscon as CONFIG\_VT replacement
  - cdev-sessions can also be integrated into system-compositor
What do we get?

- compositor: xserver, weston, directfb, ...
- emergency-console
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- legacy applications
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Related Projects

- libuterm
- dvbe/defi (vesafb.c & efifb.c as DRM drivers)
- DRM user-space documentation
- fblog/drmlog
- Wayland System-Compositor
- getting kmscon into distributions (ArchLinux already provides kmscon-6)