



Status of the Graphics Stack on FreeBSD

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The FreeBSD Project

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Introduction

Structure of this presentation

- ▶ Our major problems
- ▶ For each problem, planned solutions

For the 2 or 3 people in the room not using FreeBSD

- ▶ Description of FreeBSD-specific concepts
- ▶ **Stop me if something is unclear!**





Outline

In the kernel

A bit of history

Drivers maintenance

In the Ports tree

What is the Ports tree?

Video drivers in FreeBSD releases

The WITH_NEW_XORG mess

With the community

Future challenges



A bit of history

The era before KMS

- ▶ Originally: DRM shared with Linux and others
- ▶ Maintained by Eric Anholt

Then, KMS became mandatory

- ▶ Newer Intel GPUs only supported by the kernel driver
- ▶ Radeon GPUs to follow
- ▶ FreeBSD didn't participate in the development





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2012: import of i915 KMS driver

- ▶ Copy of the old DRM code
`sys/dev/drm` → `sys/dev/drm2`
- ▶ Import of i915 from Linux 3.2 (?)
- ▶ Only features required by i915 added to DRM device-independent code
- ▶ Linux APIs and data structures replaced by FreeBSD's ones
- ▶ Available in FreeBSD 9.1





2013: import of Radeon KMS driver

- ▶ Import of TTM and Radeon from Linux 3.8
- ▶ Some additions to DRM device-independent code
- ▶ Linux APIs and data structures replaced by FreeBSD's ones
- ▶ Available in FreeBSD 9.3





Gratuitous changes all over the place

- ▶ Usage of FreeBSD APIs and data structures
- ▶ Incomplete implementation of DRM
- ▶ Some variables renamed

⇒ Very hard to import new code from Linux





Resuming work

What's ready

- ▶ Update to i915 close to completion
- ▶ Sync DRM device-independent code with Linux 3.8 ready

In the longer term

- ▶ Plan to use a Linux API wrapper to ease the work
Caveat: need to convince people
- ▶ Get rid of the code duplication (`drm` vs. `drm2` directories)





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What is the Ports tree?

The Ports tree

What is the Ports tree?

- ▶ Packaging of 3rd-party applications
- ▶ Repository of `Makefiles` and patches
- ▶ Equivalent of `debian` directories or `.spec` files

How to install a port

```
cd /usr/ports/x11-servers/xorg-server  
make all install clean
```

(higher-level tools are available)



FreeBSD





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What is the Ports tree?

The Ports tree

- ▶ Unique tree for all supported releases of FreeBSD
- ▶ Pro: All releases have access to recent applications
- ▶ Con: A package needs to handle missing features in older releases





What is the Ports tree?

The Ports tree

- ▶ **Historically: distribution of the Ports tree**
- ▶ For a year: transition to binary packages as 1st class citizen
- ▶ Require many changes in the Ports tree and in habits
- ▶ Missing features
For us, a `Provides`-like mechanism





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Video drivers in FreeBSD releases

KMS drivers in FreeBSD

FreeBSD	Release	EOL	Drivers
8.4	Jun 2014	Jun 2015	(none)
9.1	Dec 2012	Dec 2014	i915
9.2	Sep 2013	Dec 2014	i915
9.3	Jul 2014	Dec 2016	i915, Radeon
10.0	Jan 2014	Jan 2015	i915, Radeon
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Video drivers in FreeBSD releases

The graphics stack in the Ports tree

FreeBSD	xserver	Intel DDX	ATI DDX	Mesa
8.4	1.7	2.7	6.14	7.6
9.1	1.12	2.21	6.14	9.1
9.2	1.12	2.21	6.14	9.1
9.3	1.12	2.21	7.x	9.1
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Remember

- ▶ One tree to support all releases
- ▶ No `Provides`-like feature

⇒ "Solution" (as in ugly workaround): `WITH_NEW_XORG`





The WITH_NEW_XORG mess

WITH_NEW_XORG: how it works

- ▶ Build-time flag in the Ports tree
- ▶ Select between two sets:

WITHOUT_NEW_XORG	WITH_NEW_XORG
xserver 1.7	xserver 1.12
xf86-video-intel 2.7	xf86-video-intal 2.21
xf86-video-ati 6.x	xf86-video-ati 7.x
Mesa 7.6	Mesa 9.1



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The WITH_NEW_XORG mess

WITH_NEW_XORG: how it ~~works~~ doesn't work

- ▶ **Build-time: unsuitable for a binary packages repository**
 - ▶ Bind two unrelated applications: xserver and Mesa
 - ▶ Nightmare to maintain
 - ▶ Very confusing for end users
 - ▶ Only solution until `Provides` feature is implemented
- ⇒ A fiasco for both developers and end users





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The WITH_NEW_XORG mess

WITH_NEW_XORG: about to be removed!

- ▶ Way too expensive to maintain
- ▶ Cripple progress on today's software/hardware
- ▶ Cairo 1.12 + xf86-video-intel 2.7 already crash X
- ▶ Took a long time to convince people...



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Our team

Small

- ▶ Two developers in the kernel
- ▶ Two developers in the ports
- ▶ Not all fully dedicated to the graphics stack

Still learning

- ▶ Lack of X11 expertise and understanding of hardware
- ▶ Low confidence in what we do sometimes





Users are afraid of changes

- ▶ Big rocky jumps instead of small incremental changes
Example: xserver 1.7/Mesa 7.6 → xserver 1.12/Mesa 9.1
- ▶ We don't teach our users
Example: Why are video drivers moved to the kernel?
- ▶ Many FreeBSD developers use Mac OS X

⇒ Gives a bad impression





No relation with upstream

- ▶ Little effort to talk and work with you
- ▶ Only consuming, almost no contribution





Talking about what we do

Existing tools

- ▶ A wiki section dedicated to the graphics stack
- ▶ Quarterly status reports
- ▶ Increased presence on mailing-lists and IRC

Explore more methods

- ▶ Improve bug reports handling
- ▶ Increase publications, maybe on a blog?
- ▶ Teach users





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The KMS drivers

- ▶ Finish to sync DRM and drivers with Linux 3.8
- ▶ Sync with later Linux release (3.10?)
- ▶ Implement dmabuf/PRIME
- ▶ Import Nouveau as time permits





GPGPU and OpenCL

- ▶ Continue the work on an alternative to udev
- ▶ Finish packaging of libgbm and Clover





Root-less X server

- ▶ Work on an alternative to systemd-logind?





Wayland and Weston

- ▶ Help with the evdev GSoC
- ▶ Finish packaging of Wayland
- ▶ Port libinput
- ▶ Port Weston





Working again with you all!

- ▶ Contribute code
- ▶ Talk with you
- ▶ Come back to XDC



For further reading



Our wiki section.

Roadmap, projects' status and contact information.

<https://wiki.freebsd.org/Graphics>





Summary

- ▶ Get rid of the legacy graphics stack in the Ports tree
- ▶ Ease the work in the kernel
- ▶ Improve our communication skills
- ▶ Work with you

