# DRI megadrivers

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# History

- DRI drivers used to each link a copy of mesa in themselves
  - Did you know the linker doesn't garbage collect symbols?
- Christopher James Halse Rogers added the dricore option in Feb 2011
  - “This saves about 30MB on disc with a full complement of classic DRI drivers.”
- Made mandatory for classic Mesa drivers in Jan 2012

# Problems

- All mesa core symbols become public
  - Most mesa symbols are “_mesa_Whatever”
  - Some mesa symbols are “_vbo_Whatever”
  - Some mesa symbols are just “Whatever”
    - Notably hash_table_insert().
- Performance hit due to library interface
- Never extended to gallium

# A possible solution:

- Build all the drivers together with Mesa core
  - Only the driver entrypoints are public
  - No performance loss
  - Even less disk space

# The downside

- Single driver extension symbol no longer sufficient
  - Loaders get updated to use a __driDriverGetExtensions_DRIVERNAME() instead of the __driDriverExtensions table.
- Multiple drivers exposing the same global symbol conflict
  - i915 vs i965 (intel_miptree_create())
  - radeon vs r200 (radeon_miptree_create())
- dri/common reaches back into the driver
  - for now driDriverAPI just gets smashed by the driver at __driDriverGetExtensions() time

# Dealing with symbol conflicts

- Compare:
  - `144: 00000000000029d0  516 FUNC  GLOBAL HIDDEN  1 intel_miptree_map`
  - `6:  0000000000000090  161 FUNC  LOCAL  DEFAULT  1 intel_miptree_slice_resolve`
- Pre-link the drivers to resolve references to global symbols.
- Use libelf to demote GLOBAL HIDDEN symbols to LOCAL.
  - code still to be written!

# Size comparison

| | |
|---|---|
| non-dricore | 110368k |
| dricore | 95708k |
| megadriver i965/nouveau | 98624k |
| ubuntu's libgl1-mesa-dri | 15852k |

# CPU overhead change

GLB 2.7 t-rex FPS with INTEL_NO_HW=1

```
x before
+ after
+--------------------------------------------------------------------------------+
|                                  +    x                                        |
|                              x   +    x                                        |
|                      x     x  x   +x x x       +   +                           |
|            x    xxx x x   x *x+* *++x x * +     +   +  + x+*    +            +      + |
|x  x        x+*+x*x**x*x x+x***+*x*++*+x * +  *x+++ x+x+*+x+*   ++* xx   + *+ +    + +x|
|                |_________|___M__A______M__A_____|___________|                    |
+--------------------------------------------------------------------------------+
    N           Min           Max        Median           Avg        Stddev
x  60        294.06         348.5         314.4       316.123     11.323674
+  60        302.33        347.85        321.45      323.1565     11.998666
Difference at 95.0% confidence
7.0335 +/- 4.17464
2.22493% +/- 1.32058%
(Student's t, pooled s = 11.6661)
```

# Next steps

- Build the symbol conflict avoidance ELF tool
- Convert the remaining classic drivers
- Convert gallium drivers