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

<table>
<thead>
<tr>
<th></th>
<th>Size (kB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-dricore</td>
<td>110368k</td>
</tr>
<tr>
<td>dricore</td>
<td>95708k</td>
</tr>
<tr>
<td>megadriver i965/nouveau</td>
<td>98624k</td>
</tr>
<tr>
<td>ubuntu's libgl1-mesa-dri</td>
<td>15852k</td>
</tr>
</tbody>
</table>
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+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