Graphics Drivers for Modern Gaming

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Outline

- GPUs we care about
- Driver capabilities
- Driver reliability
- Performance
- Conclusions & way forward
## GPUs

<table>
<thead>
<tr>
<th>D3D Version</th>
<th>NVidia</th>
<th>AMD</th>
<th>Intel</th>
<th>Marketshare</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 7</td>
<td>GeForce 2</td>
<td></td>
<td>?</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>GeForce 3/4</td>
<td>Radeon 8500</td>
<td>?</td>
<td>1.76 %</td>
</tr>
<tr>
<td>9</td>
<td>GeForce 5/6/7</td>
<td>Radeon 9500</td>
<td>i945</td>
<td>4.39 %</td>
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<tr>
<td>&gt;= 10</td>
<td>&gt;= GeForce 8</td>
<td>Radeon HD 2xxx</td>
<td>i965</td>
<td>93.85 %</td>
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<tr>
<td>Marketshare</td>
<td>52.22</td>
<td>34.00</td>
<td>13.32</td>
<td></td>
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Source: Steam Hardware Survey, Q4 2012

| Chip Sales | 18.5 | 21.2 | 69.8 |

Source: [www.guru3d.com](http://www.guru3d.com), November 2012
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Driver Features

- Major features Wine needs are there
- Open Source drivers are behind on OpenGL 3+
- Features missing in legacy GL contexts on OSX
- Wine lacks Direct3D10 & Direct3D11 support
Driver reliability

- Do advertised features work?
  - Also: No over-advertising
- Crashes?
- Correct handling of corner cases?
- Software fallbacks?
- Developer responsiveness?
## Driver reliability

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<th>Crashes?</th>
<th>Corner cases?</th>
<th>Dev responsive</th>
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<tr>
<td>NVidia</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Mixed</td>
</tr>
<tr>
<td>AMD</td>
<td>Yes</td>
<td>Some</td>
<td>Mostly</td>
<td>Mixed</td>
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<tr>
<td>Mesa</td>
<td>Yes</td>
<td>Rare</td>
<td>Yes</td>
<td>Good</td>
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<tr>
<td>Apple</td>
<td>Overadvertised</td>
<td>Some</td>
<td>Yes</td>
<td>Blargh</td>
</tr>
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</table>

Source: My 2c
Performance

• The point where I can present data...
Benchmarking is Difficult

- **CPU**
  - Game, Driver, OS, Wine

- **Bus**
  - PCIe, AGP, PCI

- **GPU**
  - Shaders, GPU cmds
No Tweaks

• Default Wine config
  – Specifically: GLSL shaders
• No optimization hacks
• Some well-known steps to ensure good system state:
  – Clean Windows autostart
  – S3TC library for Mesa
  – No desktop compositing
Nvidia GeForce 9600

- Macbook Pro 5,1
- Core 2 Duo, 2 GHZ
- 8 GB memory
- Windows 7 and Gentoo
- Nvidia proprietary driver
  - Sorry, no OSX or Nouveau. I ran out of time.
Nvidia GeForce 9600
CPU Limited Config

Win D3D
Win GL
Linux Native
Wine GL
Wine D3D

perf
Nvidia GeForce 9600 GPU Limited Config

- Win D3D
- Win GL
- Linux Native
- Wine GL
- Wine D3D

Bar chart showing performance (perf) for different configurations.
AMD Radeon HD 5770

- Intel Core i7 CPU
- 8 GB memory
- Windows 7, Gentoo
- r600g and Fglrx tested
AMD Radeon HD 5770
GPU Limited Config

![Bar Chart]

- Win D3D
- Win GL
- Lnx fglrx
- Wine fglrx GL
- Wine r600g GL
- Wine r600g d3d

perf
Intel GMA X3100 / i965

- Macbook (Model number unknown)
- Core 2 duo CPU
- 3 GB of memory
- Windows 7, Gentoo
- Mesa i965 driver
- Sorry, no OS X either :-(
  - Spoiler: It's BAAAAAAD
Intel GMA X3100 / i965
(somewhat) CPU Limited Config

Windows D3D
Windows GL
Linux GL
Conclusions 1

- Wine's D3D performance still sucks
- The rest of Wine is OK
- Nvidia driver performance is OK
- Intel driver perf probably OK
  - Crashes made testing hard
- Fglrx, r600g bad
  - Mesa devs, Phoronix.com: Don't compare r600g to Fglrx
- Too bad I didn't have time to test OSX
Conclusions 2

• D3D worker thread helps Windows
  – But it is not a magic bullet
• Keep an eye on GPU-Side performance
• Differences between GPUs of the same vendor
  – Even when using the same driver
The Way Forward

- Performance will require lots of work
  - At least it's focused on wined3d
- We want a worker thread for d3d
- Many game-specific problems
- Hunt down and fix one isolated bug after another
Threats to Validity

• Game-specific bugs
• Some game settings not properly controlled
  – Texture filtering in Trackmania Nations
  – Default settings in HL2 on i965
• Manual calculations
  – Typos, incorrect number transfer, etc.
• Needs more and better test apps
Raw Data

- http://tinyurl.com/b2fdqx8
- http://tinyurl.com/cgx89yt
- http://tinyurl.com/agwpees
- Thanks to openbenchmarking.org for automation help.
Thanks for your attention

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