Developing Graphics Tech for non-AAA games

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Unity / nesnausk!
Me

- Lead Gfx Coder at Unity
- nesnausk! group
Most of this talk based on Unity experience

YMMV
Outline

- Hardware
- Features
- Cross platform
- Stability
- Testing
Hardware
The future is

- Your game needs DX11, so get started now!
So bright we’ll have to

- 64 bit is here!
Wear Sunglasses

- Eww, GeForce 8600? That’s low end now!
The grim reality

• Data to the rescue

• Steam:
  • store.steampowered.com/hwsurvey

• Unity:
  • unity3d.com/webplayer/hwstats
2009 Q3: DX10

- DX10 (GPU+Vista): 13.2%
2009 Q3: 64 bit

- 64 bit Windows: 5.7%
2009 Q3: low end

- 90% of the market is worse than GeForce 8600
Unhappy stats

- Netbook with a crappy GPU
- Is your typical user
The upside

- Buying a netbook is cheap
- Going mobile/handheld is easier
- Turn-key bullet points for high end
  - e.g. SSAO
Gfx Features
Stats again

The diagram shows the performance comparison of different graphics APIs over time. The y-axis represents performance percentage, while the x-axis represents quarters from 2008 Q2 to 2009 Q3. The legend on the right indicates the different APIs:

- **Fixed Function**
- **DX9 (2.x)**
- **DX9 (3.0)**
- **DX10 (4.x)**

Each API is represented by a different color:

- Black: Software (no drivers)
- Dark grey: Fixed Function
- Green: DX9 (1.x)
- Light green: DX9 (2.x)
- Yellow: DX9 (3.0)
- Orange: DX10 (4.x)
Features

- Fixed function still 20%
- and iPhone, ...
- SM1.x is dead
Features

• SM2.0 is okay! 75%!
• Careful with FP, MRTs etc.
• Intel
Render paths

• “It displays something”
• Fixed function
• Vertex lighting, two textures
• GPUs too slow for fancy multipass stuff anyway
Render paths

- “I see dead shaders”
- Shader Model 2.0
- No float textures
- No MRT
- Some post-fx
- Most Intel, low end NV/ATI
Render paths

- “Oooh, look at that pixel shader!”
- Shader Model 2.0+
- FP, MRT
- Decent bandwidth/fillrate!
- Do the usual bullet points
Cross Platform
Do you care?

- Yes?
- No?
- Both answers are okay!
OpenGL myth

- No, OpenGL is not the answer
- Unless “platforms” mean OS X / Linux
OpenGL myth

- Windows: unusable
- Consoles: yeah right
- Mobile: GL ES is not OpenGL
Cross platform

- API does not matter
- Hardware is similar
- Everything is data
Platform abstraction

- Abstract/wrap what you need
- At granularity you need
- Don’t try to emulate whole GL on D3D
Stability
Gfx Drivers

• #1 problem on PC
• No one updates their drivers
• OpenGL/Windows is unusable
• OpenGL/OSX breaks from time to time
Gfx Drivers

- Some seriously broken

```cpp
if (vendorString == "SiS")
{
    if (rendererString.find("Mirage") != std::npos)
    {
        printf("GL: SiS Mirage, broken OpenGL\n");
        m_TotallyBroken = true;
    }
}
```

- Yet Mirage is 1.2% of the market!
Bad News

- IHVs won’t fix drivers for you
- IHVs won’t optimize drivers for you
- IHVs won’t fix the game for you
Good news

- Drivers are not that bad
- If don’t try OpenGL/Windows
- Quality is getting better
Testing
Testing Gfx

- Buy GPUs you target

<table>
<thead>
<tr>
<th>GPU</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel 945 (GMA 950)</td>
<td>14.2%</td>
</tr>
<tr>
<td>GeForce 6100</td>
<td>8.5%</td>
</tr>
<tr>
<td>Intel 965 (GMA X3x00)</td>
<td>6.3%</td>
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<tr>
<td>Radeon X300/X550/Xpress200/1100</td>
<td>5.8%</td>
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<tr>
<td>Intel G45 (GMA X4500)</td>
<td>4.3%</td>
</tr>
<tr>
<td>Intel 915 (GMA 900)</td>
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<tr>
<td>Intel 845</td>
<td>3.5%</td>
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<tr>
<td>Intel 865</td>
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<tr>
<td>GDI Generic</td>
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<td>S3 UniChrome</td>
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<td>GeForce 7000/7100</td>
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<td>Radeon X700/X1200</td>
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<td>GeForce FX 5200/5100/PCX5300</td>
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<tr>
<td>SIS Mirage/315/630/730</td>
<td>1.2%</td>
</tr>
<tr>
<td>GeForce 6200</td>
<td>1.1%</td>
</tr>
<tr>
<td>Radeon 9200</td>
<td>1.1%</td>
</tr>
</tbody>
</table>
Test Farm
Functional Tests
Regression Tests

- Run on D3D REF
- Dump screenshots
- Continuous Integration server
Regression Tests

Project GraphicsFunctionalTest

- Test Result Trend
- Workspace
- Recent Changes
- Latest Test Result (1 failure / 10)

Permalinks
- Last build (#218), 8 hr 35 min ago
- Last stable build (#152), 1 mo 17 days ago
- Last successful build (#218), 8 hr 35 min ago
- Last failed build (#214), 2 days 15 hr ago
In short

- Don’t believe the hype
- Run on low end
- SM2.0 is okay
- Test yourself
Q?