OpenGL Performance Tools

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NVIDIA Developer Tools

Agenda

- NVShaderPerf 71.84
- NVPerfKIT 1.0
- Conclusion & Q&A

NVShaderPerf 71.84

Inputs:
- GLSL (fragments)
- !!FP1.0
- !!ARBfp1.0
- Cg

GPU Arch:
- GeForce FX
- GeForce 6 Series
- Quadro FX

NVShaderPerf

Outputs:
- Assembly code
- # of cycles
- # of temporary registers
- Pixel throughput
- Forces all fp16 and all fp32

NVShaderPerf – Next…

- Adding more complete support for vertex programs
  - Vertex Throughput
  - GLSL Vertex Scheduling
- Support for multiple driver versions from one release

NVPerfKit 1.0

- **Complete Performance Instrumentation Solution**
  - **Instrumented Driver**
  - **NVIDIA Developer Control Panel**
  - **Supports PDH (Performance Data Helper)**
  - **Code Samples for OpenGL and Direct3D**
  - **Requires Instrumented Applications to be Authorized**

NVPerfKit

- **Instrumented Driver**
  - Exposes GPU and Driver Performance Counters
  - Supports OpenGL
  - Supports SLI Counters
  - Requires GeForce FX and 6 Series
- **NVIDIA Developer Control Panel**
  - Required to enable the counters to be sampled
  - Easy GUI to preset counter bundles

NVPerfKit

- **OpenGL Driver Counters:**
  - **FPS & frame time (1/FPS)**
  - **AGP texture, VBO, and total memory used**
  - **Video texture, VBO, and total memory used**
  - **driver sleep time (driver waits for GPU),**

NVPerfKit

- **HW/GPU counters:**
  - gpu idle
  - pixel shader utilization
  - vertex attribute count
  - vertex shader utilization
  - texture waits for shader
  - shader waits for texture
  - shader waits for rop
  - FastZ utilization (UltraShadow)
  - pixel, vertex, triangle, primitive & culled primitive counts

NVPerfKit

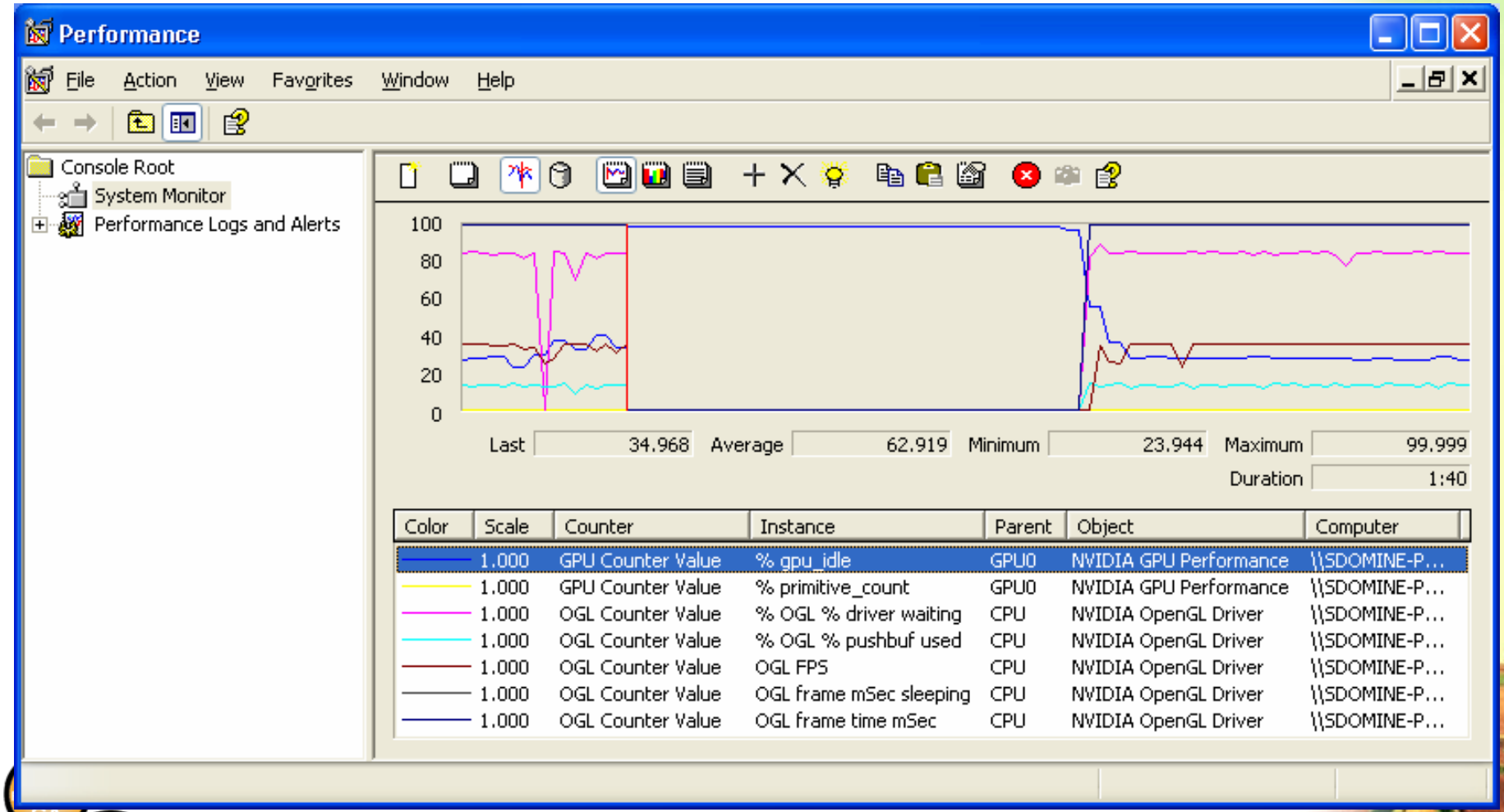
- **Microsoft Performance Data Helper(PDH)**
  - **WMI (Windows Management and Instrumentation)**
  - **VTune, Perfmon,...**
- **Access counters in your own application**

```
// Setup
PDH_HQUERY hQuery;
PDH_COUNTER hCounter;

PDH_STATUS status = PdhOpenQuery(0,0,&hQuery);
PdhAddCounter(hQuery, "\\NVIDIA GPU Performance(GPU0/% gpu_idle)\\GPU Counter
    Value",0,&hCounter));

// Periodically...
PDH_STATUS status = PdhCollectQueryData(hQuery);
PDH_FMT_COUNTERVALUE cvValue;
PdhGetFormattedCounterValue(hCounter,PDH_FMT_DOUBLE|PDH_FMT_NOCAP100|PDH_FMT_NOSCALE,0,&cvValue)
    ;
```

NvPerfKit


Performance
File Action View Favorites Window Help
Console Root
System Monitor
Performance Logs and Alerts
100
80
60
40
20
0
Last 34.968 Average 62.919 Minimum 23.944 Maximum 99.999
Duration 1:40
Color Scale Counter Instance Parent Object Computer
1.000 GPU Counter Value % gpu_idle GPU0 NVIDIA GPU Performance \\SDOMINE-P...
1.000 GPU Counter Value % primitive_count GPU0 NVIDIA GPU Performance \\SDOMINE-P...
1.000 OGL Counter Value % OGL % driver waiting CPU NVIDIA OpenGL Driver \\SDOMINE-P...
1.000 OGL Counter Value % OGL % pushbuf used CPU NVIDIA OpenGL Driver \\SDOMINE-P...
1.000 OGL Counter Value OGL FPS CPU NVIDIA OpenGL Driver \\SDOMINE-P...
1.000 OGL Counter Value OGL frame mSec sleeping CPU NVIDIA OpenGL Driver \\SDOMINE-P...
1.000 OGL Counter Value OGL frame time mSec CPU NVIDIA OpenGL Driver \\SDOMINE-P...

NVPerfKit

- **Why a Security Mechanism?**
  - **No Reverse Engineering**
  - **Have to own the application's code**
- **How does that work?**
  - **Application are authenticated**
  - **Lightweight runtime checks**
    - **Heartbeat regularly checks for validity**

NVPerfKit

- **Schedule**
  - **Registered Developer Early Beta Access : 3/16/2005**
  - **Registered Developer Beta : 3/23/2005**
  - **Registered Developer Release Target : 4/7/2005**

Conclusion

- Shader Performance Regression Tools
- Complete Instrumentation Solution
  - NvPerfHUD for OGL
    - Just do the HUD rendering in your application
    - use PDH for the rest
- FX Composer 2.0 will support OpenGL
  - GLSL, Cg, CgFX and NVshaderPerf
- …for everything else, there is Graphics Remedy's gDEBugger