FX Composer 2 : A Comprehensive Shader Development Package

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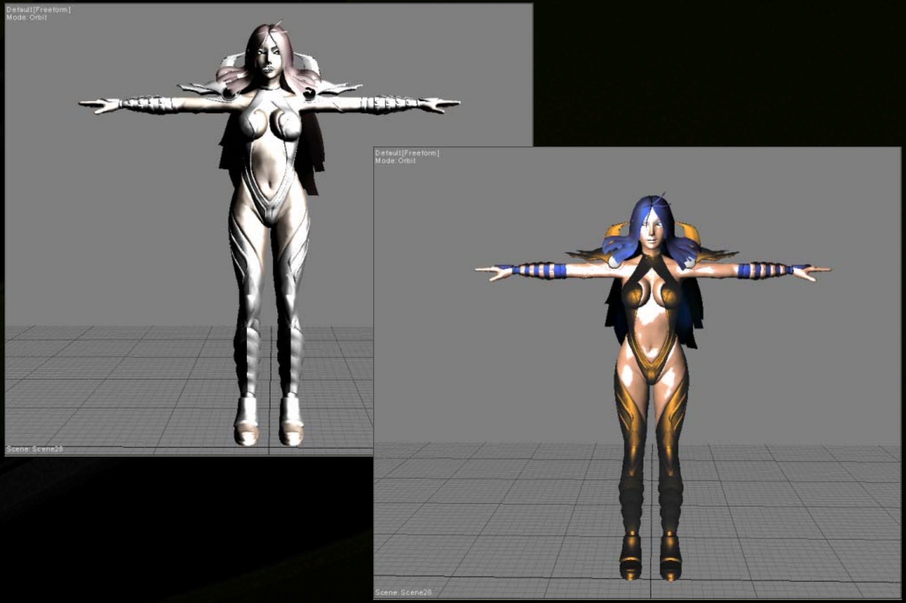
Philippe Rollin

FX Composer 2 at a glance

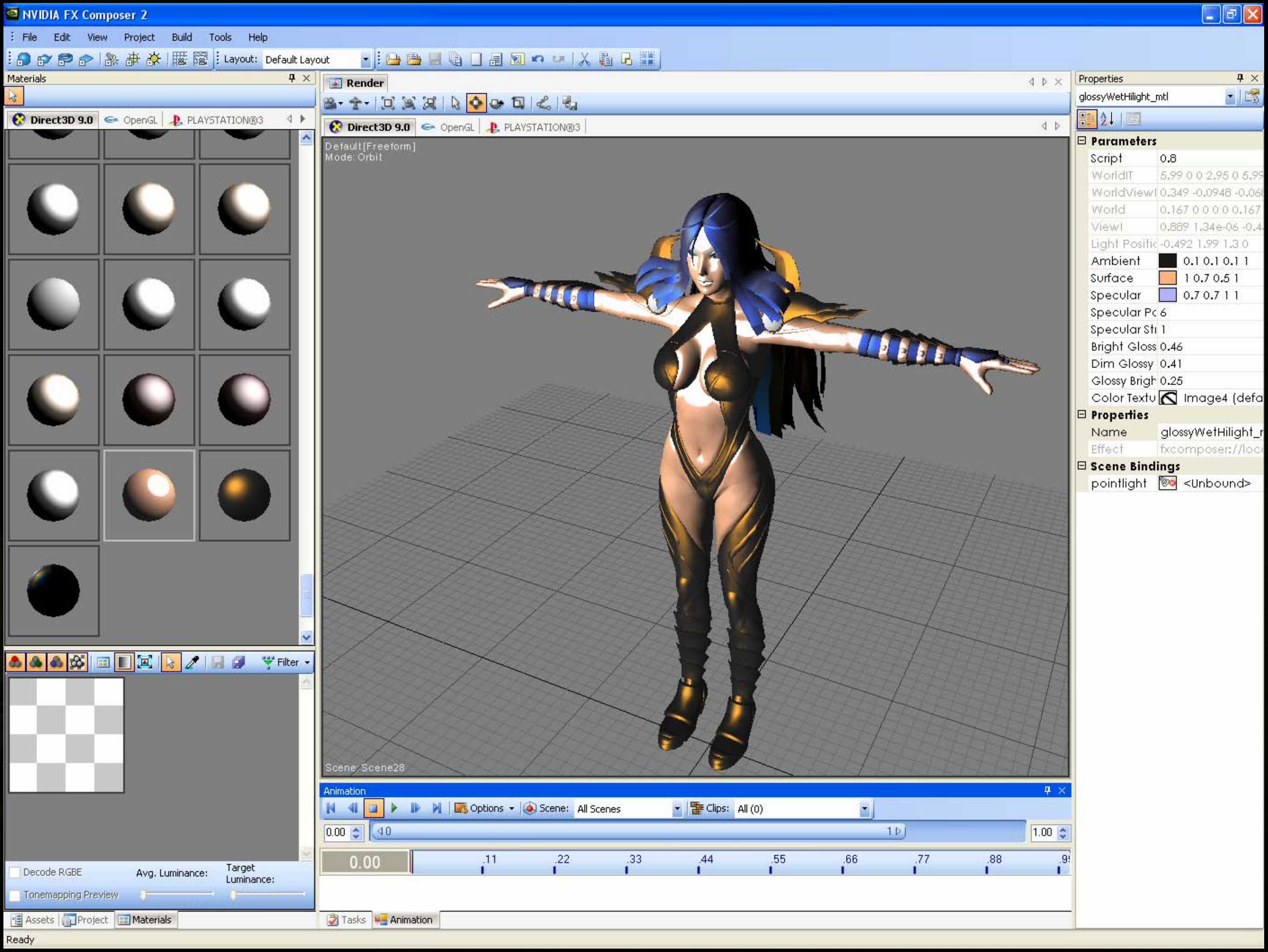
- Rapid Shader Authoring
- Easy Performance Tuning
- Streamlined Pipeline Integration

Rapid Shader Authoring

- Full featured code editor
- Simple Drag&Drop support for most assets
- Artist friendly scene navigation
- Easy shader parameter binding and tweaking



Rapid Shader Authoring



Properties

glossyWetHilight_mtl

Parameters

Script	0.8
WorldIT	5.99 0 0 2.95 0 5.99
WorldViewI	0.349 -0.0948 -0.06
World	0.167 0 0 0 0 0.167
ViewI	0.889 1.34e-06 -0.4
Light Positic	-0.492 1.99 1.3 0
Ambient	■ 0.1 0.1 0.1 1
Surface	■ 1 0.7 0.5 1
Specular	■ 0.7 0.7 1 1
Specular Pc	6
Specular Sti	1
Bright Gloss	0.46
Dim Glossy	0.41
Glossy Brigh	0.25
Color Textu	Image4 (defa

Properties

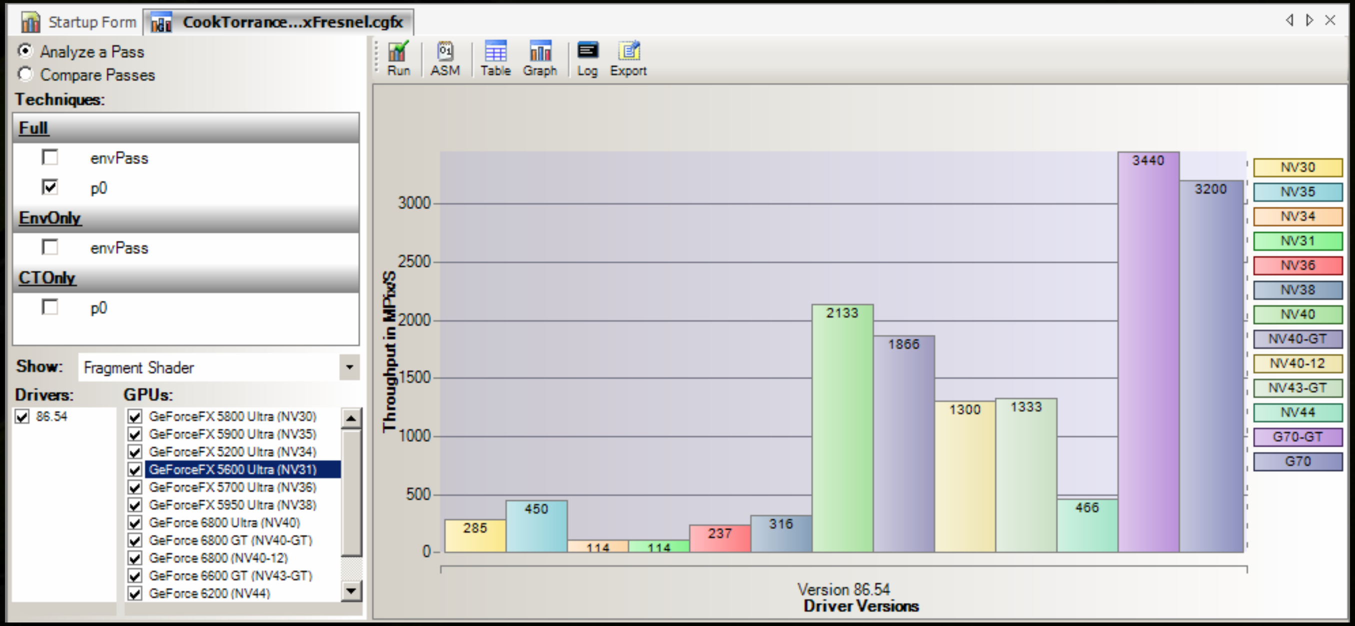
Name	glossyWetHilight_r
Effect	fxcomposer://loc

Scene Bindings

pointlight	<Unbound>

Easy Performance Tuning

- NVIDIA ShaderPerf 2.0 integration
- Easily compare multiple GPU/Driver combination
- User friendly output



Startup Form | CookTorrance...xFresnel.cgfx

● Analyze a Pass
○ Compare Passes

Techniques:

Full
- □ envPass
- ☑ p0

EnvOnly
- □ envPass

CTOnly
- □ p0

Show: Fragment Shader

Drivers:
- ☑ 86.54

GPUs:
- ☑ GeForceFX 5800 Ultra (NV30)
- ☑ GeForceFX 5900 Ultra (NV35)
- ☑ GeForceFX 5200 Ultra (NV34)
- ☑ GeForceFX 5600 Ultra (NV31)
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- ☑ GeForceFX 5950 Ultra (NV38)
- ☑ GeForce 6800 Ultra (NV40)
- ☑ GeForce 6800 GT (NV40-GT)
- ☑ GeForce 6800 (NV40-12)
- ☑ GeForce 6600 GT (NV43-GT)
- ☑ GeForce 6200 (NV44)

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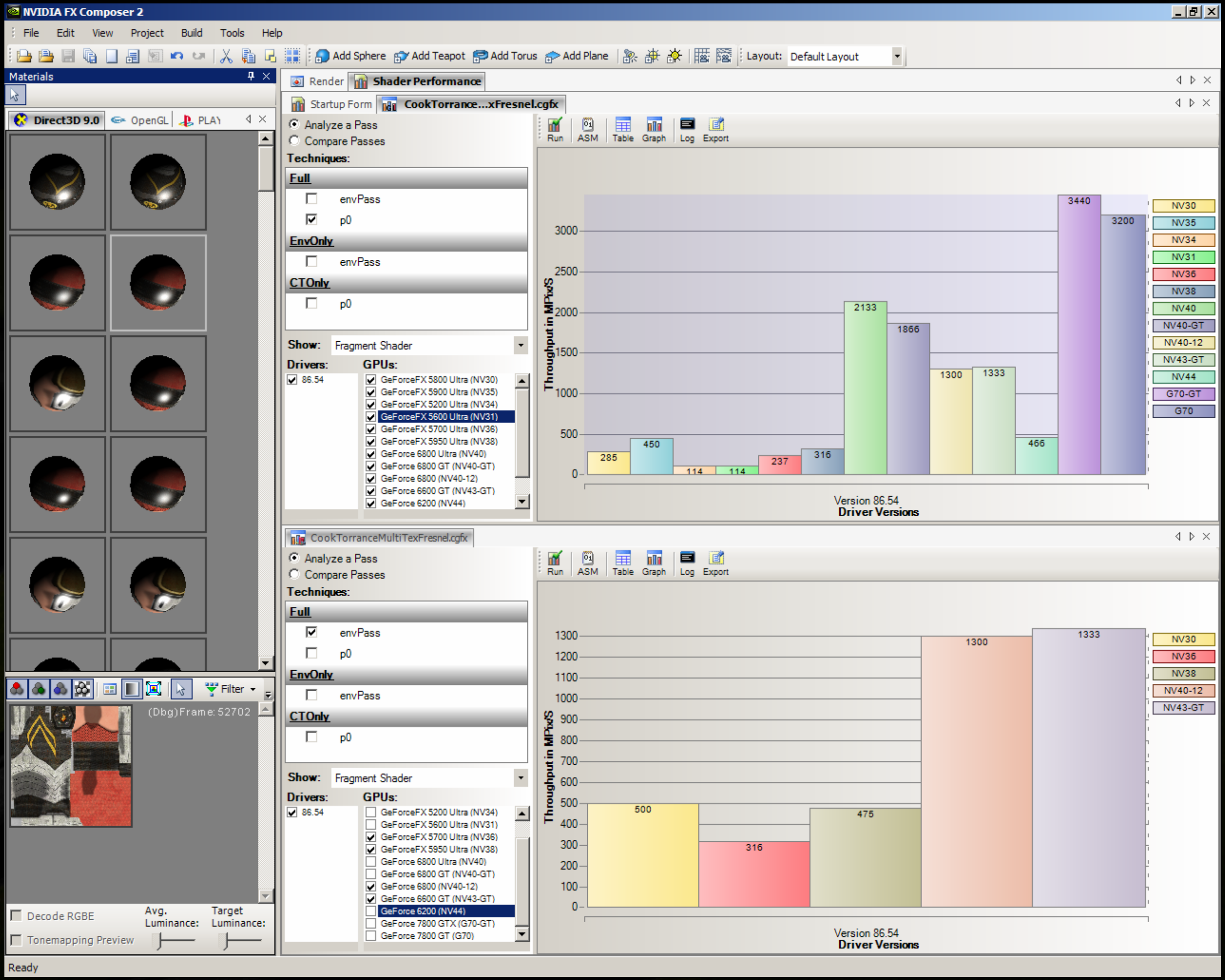
Easy Shader Performance Tuning



CookTorrance...xFresnel.cgfx

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CookTorranceMultiTexFresnel.cgfx

● Analyze a Pass
○ Compare Passes

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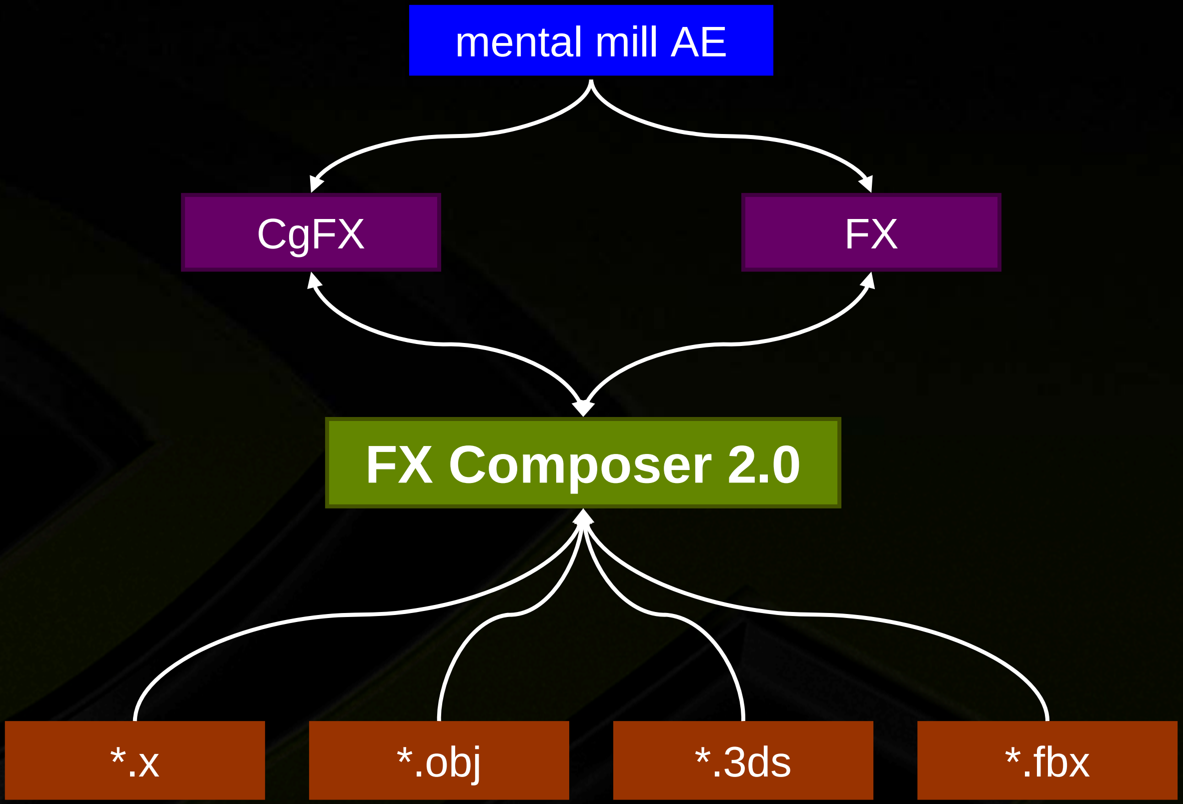
- ☐ GeForce 6200 (NV44)
- ☐ GeForce 7800 GTX (G70-GT)
- ☐ GeForce 7800 GT (G70)

Streamlined Pipeline Integration



mental mill AE

CgFX

FX

FX Composer 2.0

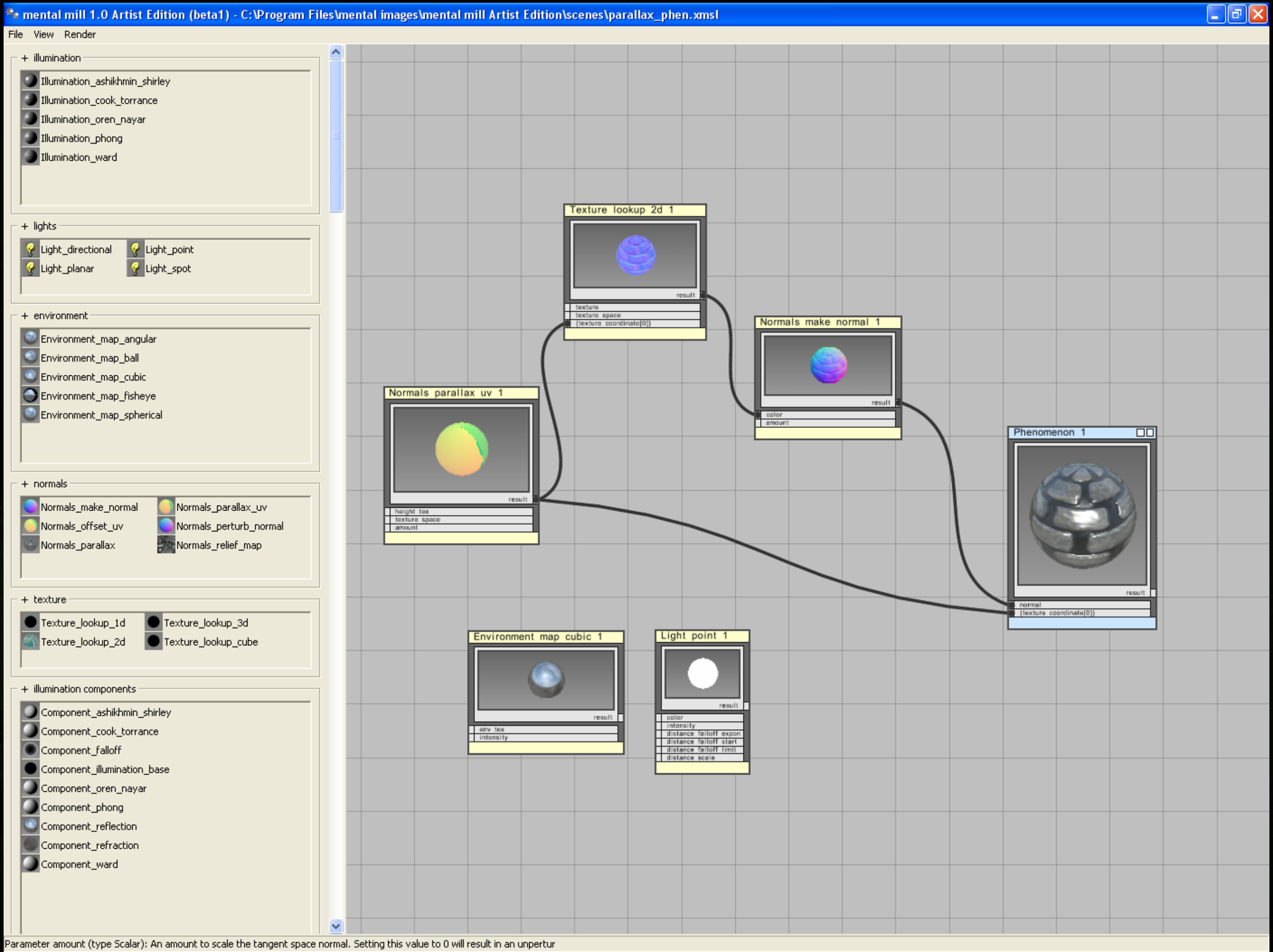
*.x

*.obj

*.3ds

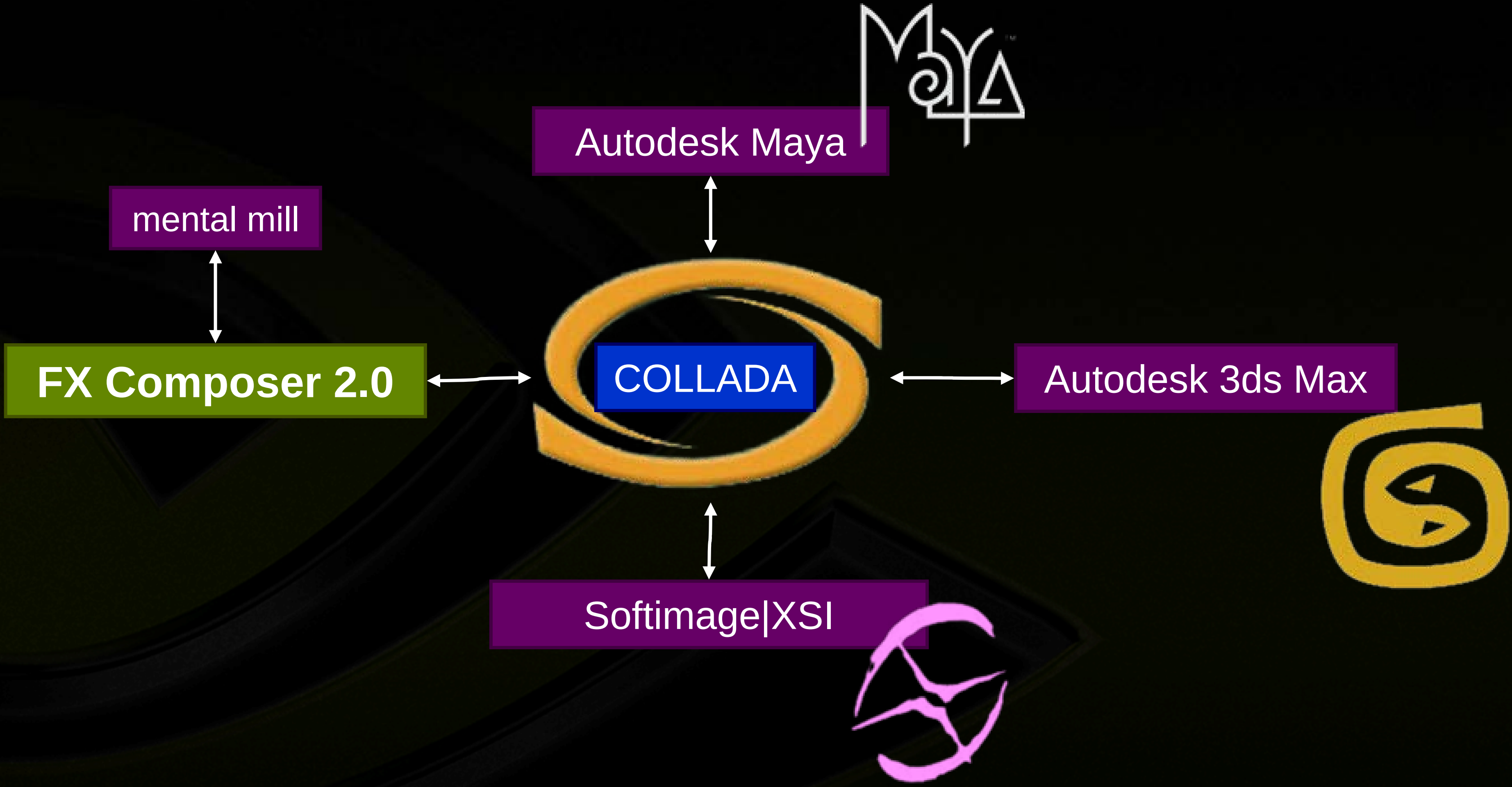
*.fbx

Mental Mill Artist Edition


mental mill 1.0 Artist Edition (beta1) - C:\Program Files\mental images\mental mill Artist Edition\scenes\parallax_phen.xmsl

Parameter amount (type Scalar): An amount to scale the tangent space normal. Setting this value to 0 will result in an unpertur

Streamlined Pipeline Integration



Autodesk Maya

mental mill

FX Composer 2.0

COLLADA

Autodesk 3ds Max

Softimage|XSI

Production pipeline Integration

- Semantic remapping
- Vertex remapping
- Scripting
- Efficient render to texture
- SDK/Programmability

Semantic Remapper

- Enable remapping of semantic names
- Complex expressions
- Custom semantic conventions for shaders
  - Simply remap names ….
  - … or create new ones and define how they are calculated

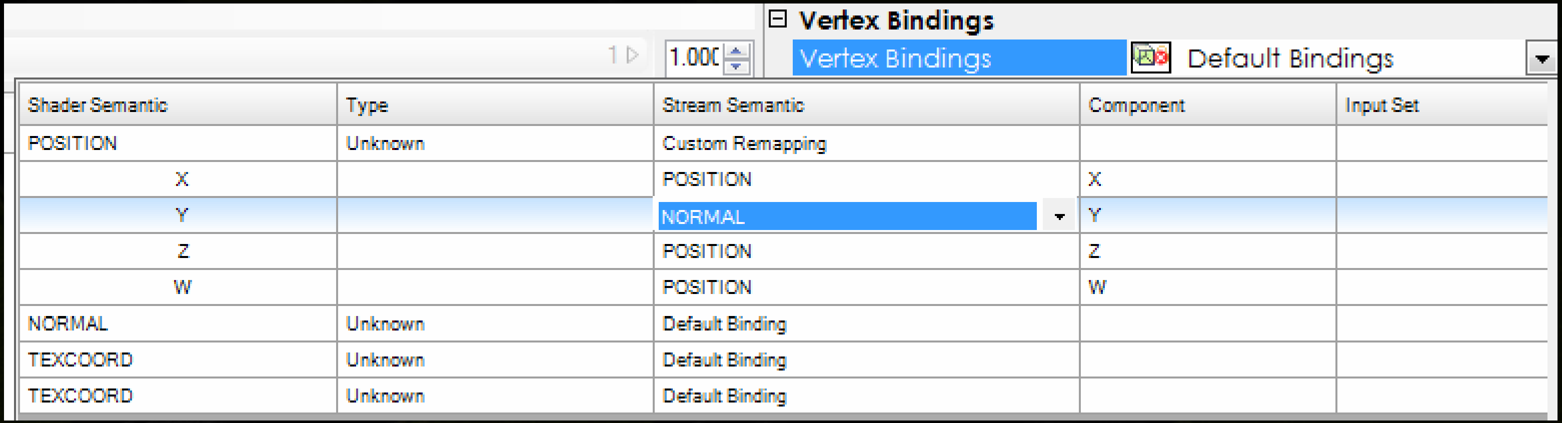
Semantic Remapping Example

```
<Remapping name="">
   <identifiers>
    <semantic value="SINTIME"/>
   </identifiers>
   <expression>
    <Multiply>
     <Add>
      <Sine>
       <input type="internalsemantic" value="currenttime"/>
      </Sine>
      <input type="float" value="1.0"/>
     </Add>
     <input type="float" value="0.5"/>
    </Multiply>
   </expression>
  </Remapping>
```

SINTIME = Sin(TIME + 1.0) * .5

Vertex Remapper

- **Remapping of geometry input streams**



Vertex Bindings: Default Bindings

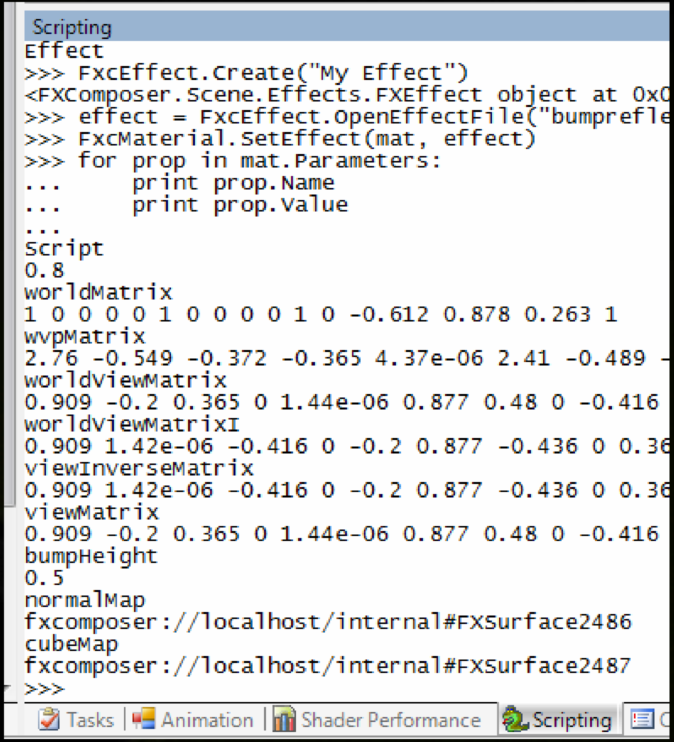
Shader Semantic	Type	Stream Semantic	Component	Input Set
POSITION	Unknown	Custom Remapping		
X		POSITION	X	
Y		NORMAL	Y	
Z		POSITION	Z	
W		POSITION	W	
NORMAL	Unknown	Default Binding		
TEXCOORD	Unknown	Default Binding		
TEXCOORD	Unknown	Default Binding		

Flexible build configuration

- Per project & per effect:
  - #defines
  - compilation parameters
- Enables ‘uber-shaders’

Scripting

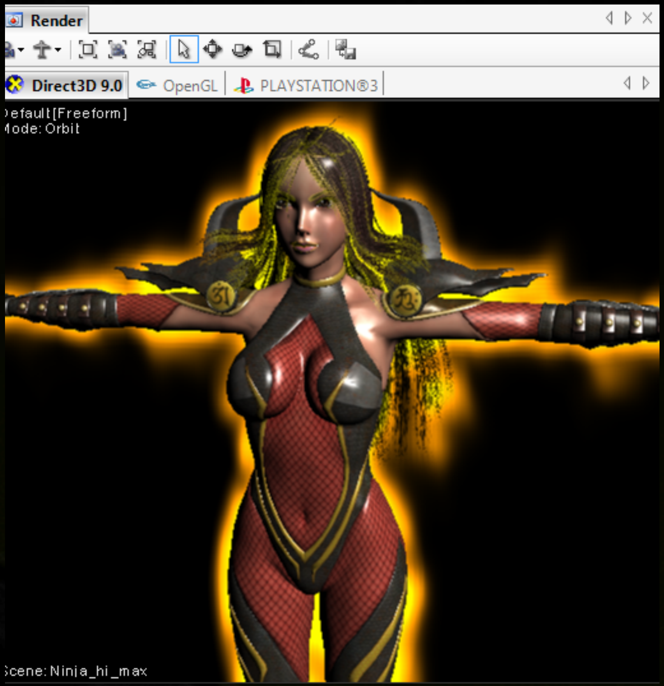
- Python scripting
  - Iron Python .NET
- Example Usage
  - Rigging lights to materials
  - Tweaking material parameters
- Scripts are integrated with Undo



```
Effect
>>> FxcEffect.Create("My Effect")
<FXComposer.Scene.Effects.FXEffect object at 0x0
>>> effect = FxcEffect.OpenEffectFile("bumprefle
>>> FxcMaterial.SetEffect(mat, effect)
>>> for prop in mat.Parameters:
...     print prop.Name
...     print prop.Value
...
Script
0.8
worldMatrix
1 0 0 0 0 1 0 0 0 0 1 0 -0.612 0.878 0.263 1
wvpMatrix
2.76 -0.549 -0.372 -0.365 4.37e-06 2.41 -0.489 -
worldViewMatrix
0.909 -0.2 0.365 0 1.44e-06 0.877 0.48 0 -0.416
worldViewMatrixI
0.909 1.42e-06 -0.416 0 -0.2 0.877 -0.436 0 0.36
viewInverseMatrix
0.909 1.42e-06 -0.416 0 -0.2 0.877 -0.436 0 0.36
viewMatrix
0.909 -0.2 0.365 0 1.44e-06 0.877 0.48 0 -0.416
bumpHeight
0.5
normalMap
fxcomposer://localhost/internal#FXSurface2486
cubeMap
fxcomposer://localhost/internal#FXSurface2487
>>>
```

Render to texture

- Full Screen Effects
  - SAS .86 – CgFX, FX
  - COLLADA FX
- Can declare shared surfaces
  - Shadow mapping
  - Texture generation



Plugin SDK

- Extensible application
- Examples:
  - Importers - sample source for .x,.obj,.3ds,.fbx
  - Exporters
  - Remapper examples
  - Custom panels/UI
  - Render Nodes – modify graph

Schedule

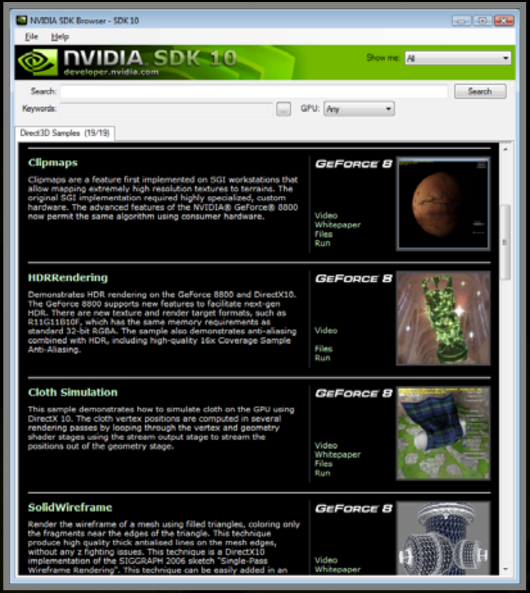
- Public Beta, early April 2007
- Final Release, early May 2007

Conclusion

- Powerful Cross-platform Shader Development Environment
- Streamlined workflow
- Asset Pipeline Integration

Six All-New NVIDIA Developer Tools!

Check it out at our booth (#5134)



Clipmaps

Clipmaps are a feature first implemented on SGI workstations that allow mapping extremely high resolution textures to terrains. The original SGI implementation required highly specialized, custom hardware. The advanced features of the NVIDIA® GeForce® 8800 now permit the same algorithm using consumer hardware.

GeForce 8 — Video, Whitepaper, Files, Run

HDRRendering

Demonstrates HDR rendering on the GeForce 8800 and DirectX10. The GeForce 8800 supports new features to facilitate next-gen HDR. There are new texture and render target formats, such as R11G11B10F, which has the same memory requirements as standard 32-bit RGBA. The sample also demonstrates anti-aliasing combined with HDR, including high-quality 16x Coverage Sample Anti-Aliasing.

GeForce 8 — Video, Files, Run

Cloth Simulation

This sample demonstrates how to simulate cloth on the GPU using DirectX 10. The cloth vertex positions are computed in several rendering passes by looping through the vertex and geometry shader stages using the stream output stage to stream the positions out of the geometry stage.

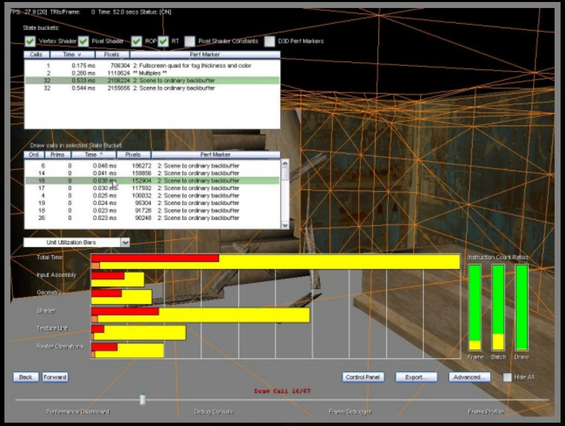
GeForce 8 — Video, Whitepaper, Files, Run

SolidWireframe

Render the wireframe of a mesh using filled triangles, coloring only the fragments near the edges of the triangle. This technique produce high quality thick antialised lines on the mesh edges, without any z fighting issues. This technique is a DirectX10 implementation of the SIGGRAPH 2006 sketch "Single-Pass Wireframe Rendering". This technique can be easily added in an

GeForce 8 — Video, Whitepaper

SDK 10



FPS: 27.9 [20] TRIs/Frame: 0 Time: 52.0 secs Status: [ON]

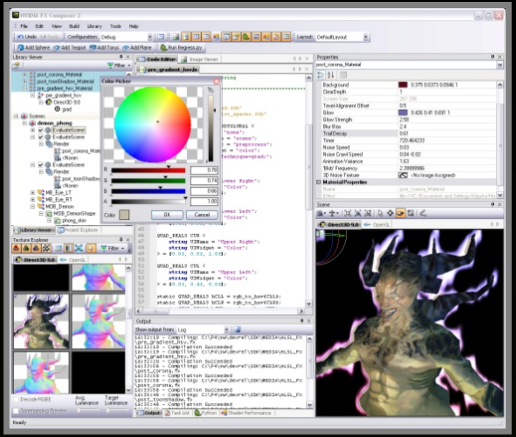
State buckets: ☑ Vertex Shader ☑ Pixel Shader ☑ ROP ☑ RT □ Pixel Shader Constants □ D3D Perf Markers

Calls	Time v	Pixels	Perf Marker
1	0.175 ms	706304	2: Fullscreen quad for fog thickness and color
2	0.280 ms	1110624	** Multiples **
32	0.533 ms	2106224	2: Scene to ordinary backbuffer
32	0.544 ms	2155656	2: Scene to ordinary backbuffer

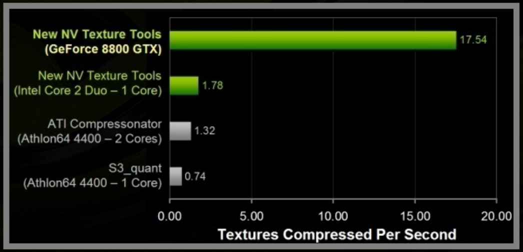
Draw calls in selected State Bucket:

Ord	Prims	Time ^	Pixels	Perf Marker
6	0	0.048 ms	186272	2: Scene to ordinary backbuffer
14	0	0.041 ms	159856	2: Scene to ordinary backbuffer
16	0	0.038 ms	152904	2: Scene to ordinary backbuffer
17	0	0.030 ms	117592	2: Scene to ordinary backbuffer
4	0	0.025 ms	100032	2: Scene to ordinary backbuffer
19	0	0.024 ms	95304	2: Scene to ordinary backbuffer
18	0	0.023 ms	91728	2: Scene to ordinary backbuffer
26	0	0.023 ms	90248	2: Scene to ordinary backbuffer

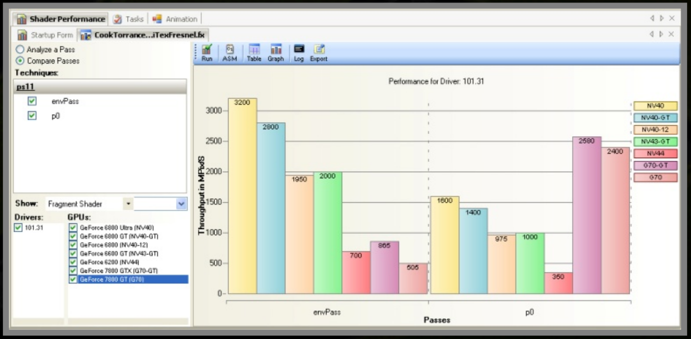
PerfKit 5



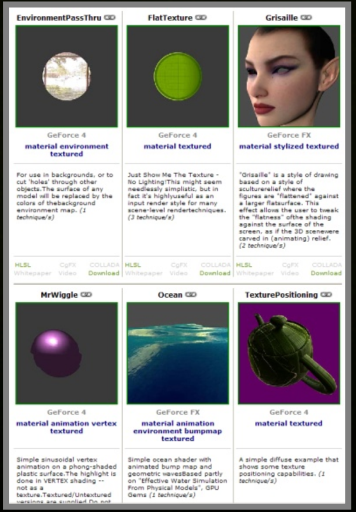
FX Composer 2



GPU-Accelerated Texture Tools



ShaderPerf 2



EnvironmentPassThru

GeForce 4

material environment textured

For use in backgrounds, or to cut 'holes' through other objects.The surface of any model will be replaced by the colors of thebackground environment map. *(1 technique/s)*

HLSL CgFX COLLADA Whitepaper Video Download

FlatTexture

GeForce 4

material textured

Just Show Me The Texture - No Lighting!This might seem needlessly simplistic, but in fact it's highlyuseful as an input render style for many scene-level rendertechniques. *(3 technique/s)*

HLSL CgFX COLLADA Whitepaper Video Download

Grisaille

GeForce FX

material stylized textured

"Grisaille" is a style of drawing based on a style of sculturerelief where the figures are "flattened" against a larger flatsurface. This effect allows the user to tweak the "flatness" ofthe shading against the surface of the screen, as if the 3D scenewere carved in (animating) relief. *(2 technique/s)*

HLSL CgFX COLLADA Whitepaper Video Download

MrWiggle

GeForce 4

material animation vertex textured

Simple sinusoidal vertex animation on a phong-shaded plastic surface.The highlight is done in VERTEX shading -- not as a texture.Textured/Untextured versions are supplied Do not

Ocean

GeForce FX

material animation environment bumpmap textured

Simple ocean shader with animated bump map and geometric wavesBased partly on "Effective Water Simulation From Physical Models", GPU Gems *(1 technique/s)*

TexturePositioning

GeForce 4

material textured

A simple diffuse example that shows some texture positioning capabilities. *(1 technique/s)*

Shader Library