Pipeline Integration with FX Composer

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Agenda

- FX Composer 1.6
  - Recap
  - DXSAS
  - Plugins
  - Scripting
- Preview of FX Composer 2

FX Composer History

- **FX Composer 1.0 shipped last January**
  - **~100 .fx files, ~30 projects out of the box**
  - **Support for all ps/vs profiles in DX9b**
- **FX Composer 1.5 shipped November last year**
  - **Many new features, such as DXSAS .86, scripting, SDK, etc.**

FX Composer 1.6

- **FX Composer 1.6 update in February**
  - **Mainly a service release; very stable build**
  - **New .fxproj format, unpackaged**
    - **Moving towards a standard XML format (XNA, COLLADA)**
- **1.7 in the near future**
  - **Shaderperf updates**
  - **Installer improvements**

Introducing DXSAS .86

- Specification from Microsoft
  - Updated version in the current DX SDK
  - FX Composer currently supports .86
    - Waiting for scripting additions
- Defines a standard set of semantics and annotations
- Help menu brings up the current list of annotations/semantics
  - You can also use fxmapping.xml to map your own custom annotations/semantics to the spec

Example Semantics

Semantics

Semantic	Description	Data Type	Supported	FX Composer Only
diffuse#	Color value to be used as the diffuse color. The fourth channel represents diffuse alpha.	float4,float3,texture	yes	-
specular#	Color value to be used as the specular color. The fourth channel represents specular alpha.	float4,float3,texture	yes	-
	Color value to be used as			

```
float4 myColor : DIFFUSE;
float4x4 myMat : WORLDVIEW;
float elapsed : TIME;
```

Example Annotations

Annotations

Annotation	Description	Data Type	Supported	FX Composer Only
frustum	This is type is associated with a frustum	matrix	yes	-
uiname	This is a string that describes variable, i.e. a pretty name used for labeling an ui dialog	string	yes	-
uihelp	This is the string for helpful information that is displayed to a user in a tool.	string	-	-
uiwidget	Described the widget to be used to edit the value.	string	yes	-

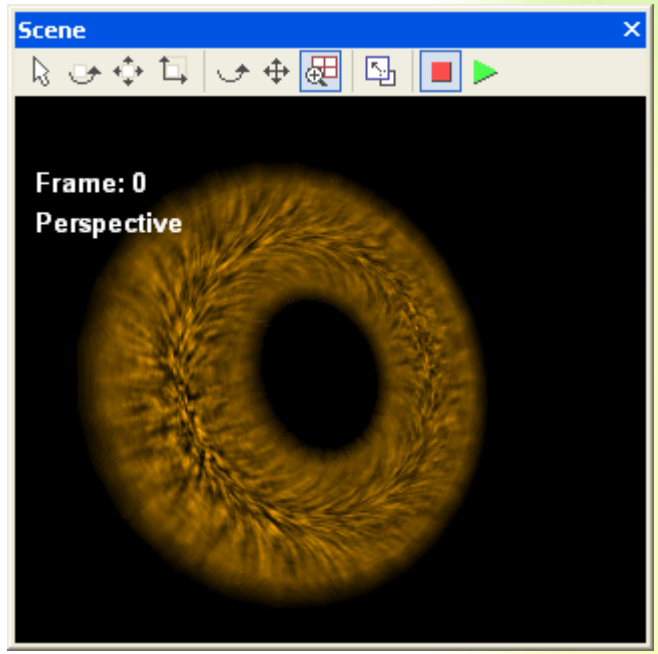
```
float4 myColor : DIFFUSE
<
        UIName=“Paint Tint”;
        UIWidget = “color”;
>;
```

ScriptExecute - .86 style

- Designed to help the effect interaction problem
- Adds powerful scripting features to effects
- A superset of the XML ‘scene commands’ that FX Composer 1.1 shipped with
  - More powerful/general
- All FX Composer effects support .86
  - Old scene command XML automatically interpreted as ScriptExecute.
  - FX Composer 2 will do SAS 1.x

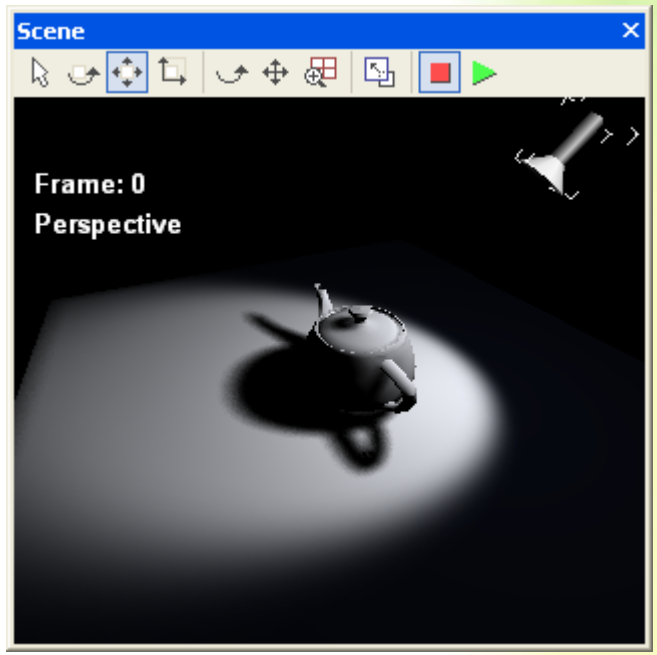
ScriptExecute: Fur Shells

- Script loops on a per-object basis
- Loop counter used to distance each fur shell
- Properties panel lets you tweak the appearance

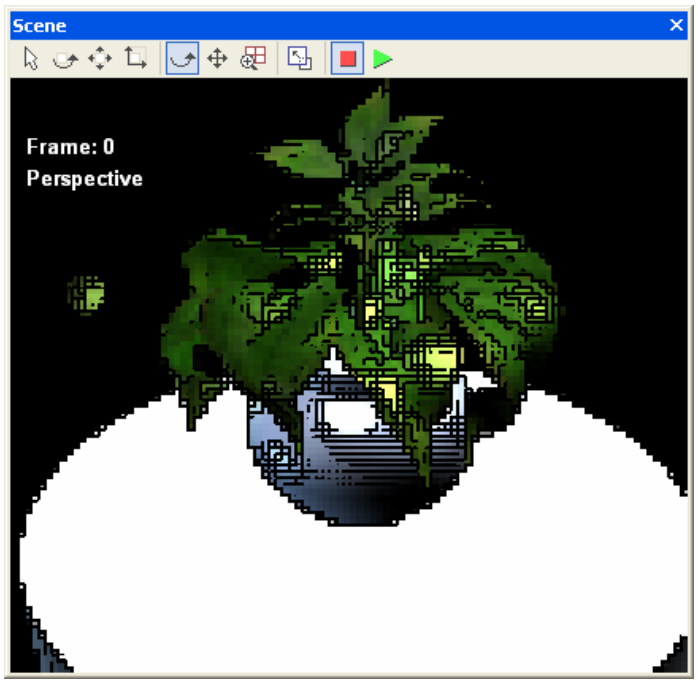


ScriptExecute: Renderport

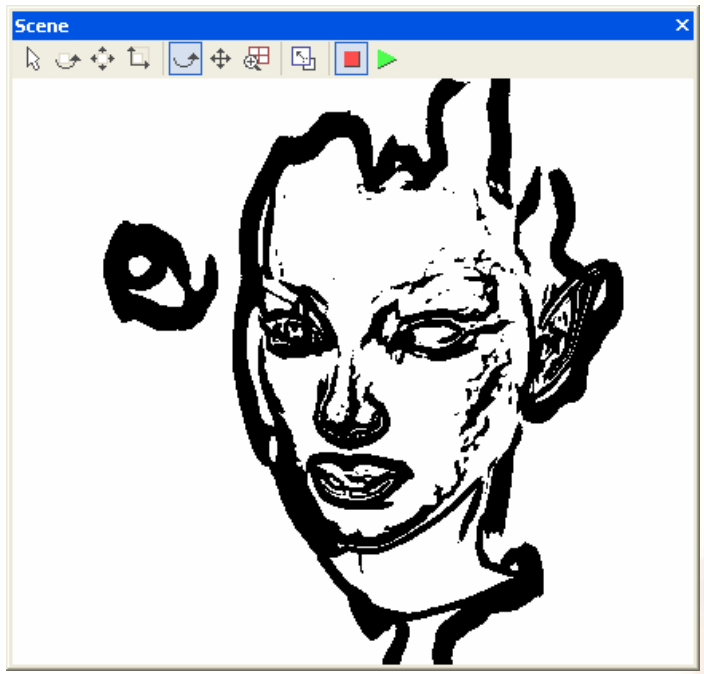
- Rendering from different POV
  - Switch camera from script
- Example scene, Soft Shadows
  - Depth map rendered from POV of light
- Current matrices are changed to use the values from the light



ScriptExecute: Shader Stacks



Tiles.fx + EdgeDetect.fx



Corona.fx + EdgeDetect.fx

ScriptExecute Summary

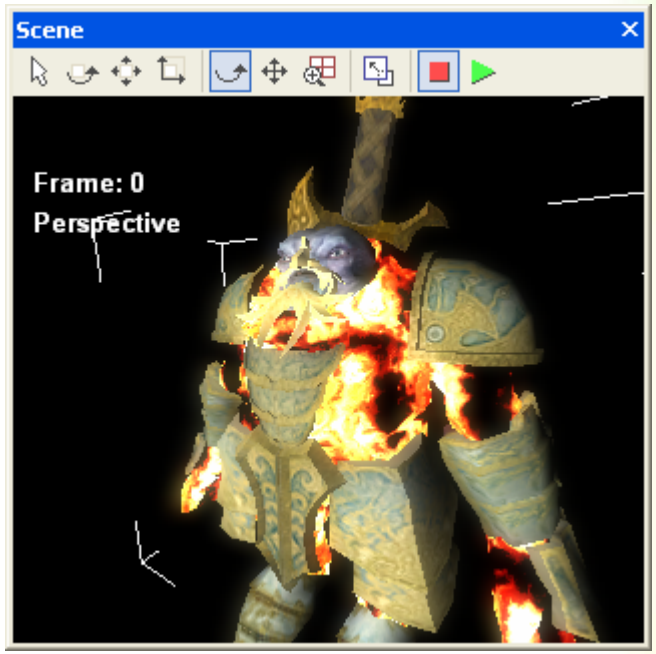
- Flexible way to solve interacting effect problems
- Not too hard to implement in the engine
  - Sample DXSAS code took about 2 weeks
- Really powerful
- A Standard – but look out for the 1.1 spec from Microsoft

DXSAS Implementations

- DCC Companies are working towards 1.x spec
- FX Composer will try to implement as full support as possible
- Microsoft working on full sample implementation for next SDK
- DXSAS .86 version implementation on latest NVSDK

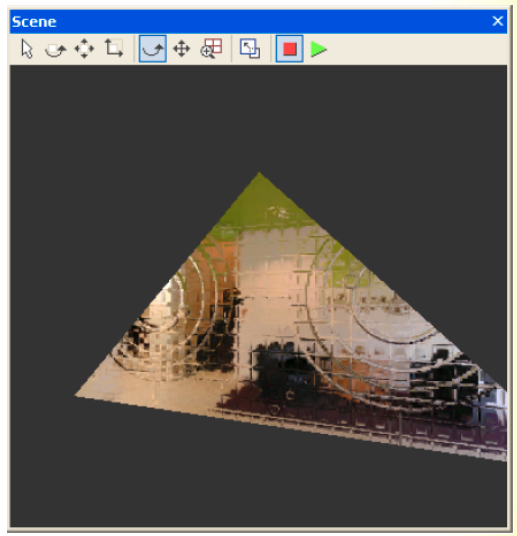
FX Composer SDK

- FX Composer 1.5 was the first version with an SDK
  - Can write plug-ins
  - Can write scripts in C# or VB.NET
- 1.6 adds samples & documentation
  - .x, .obj
  - Material exporter



Plugin Tutorial in 1.6

- **Bumpy shiny triangles!**
  - Cutting edge technology ☺
- **Already external plugins**
  - No problems reported
- **Fairly simple to build**
  - User guide has full documentation
- **VC 2003 does most of the work with a wizard**

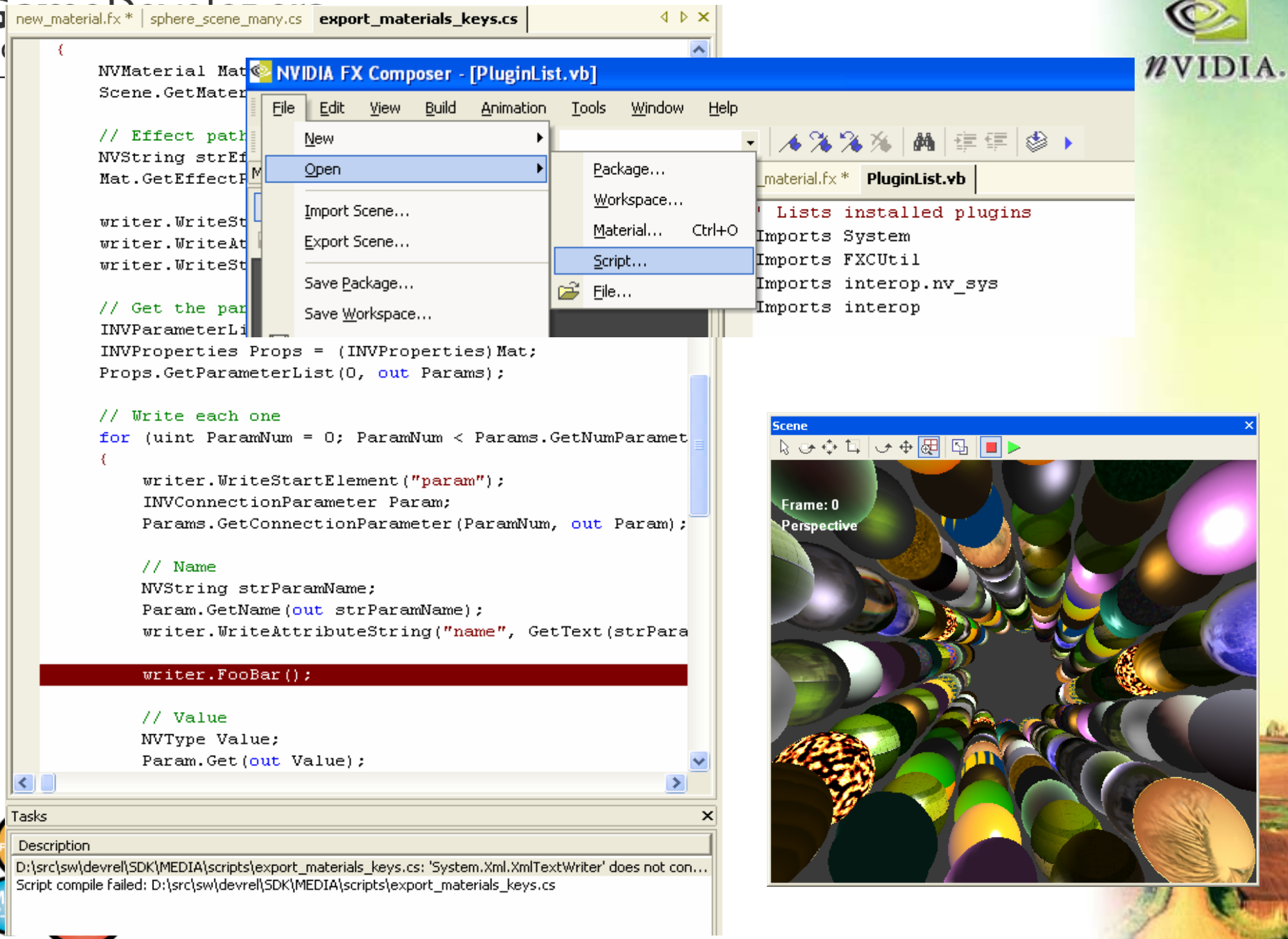


Scripting with C#/VB

- .NET scripting is a powerful new feature
  - C# and VB.NET
  - Editing & Compilation integrated into FX Composer
  - Errors displayed in task bar
    - Just like working with an effect
  - Full FX Composer engine is exposed to the script
- Disadvantages
  - No single stepping
  - No intellisense, not currently as integrated into the IDE as ‘real’ plugins

Script examples…

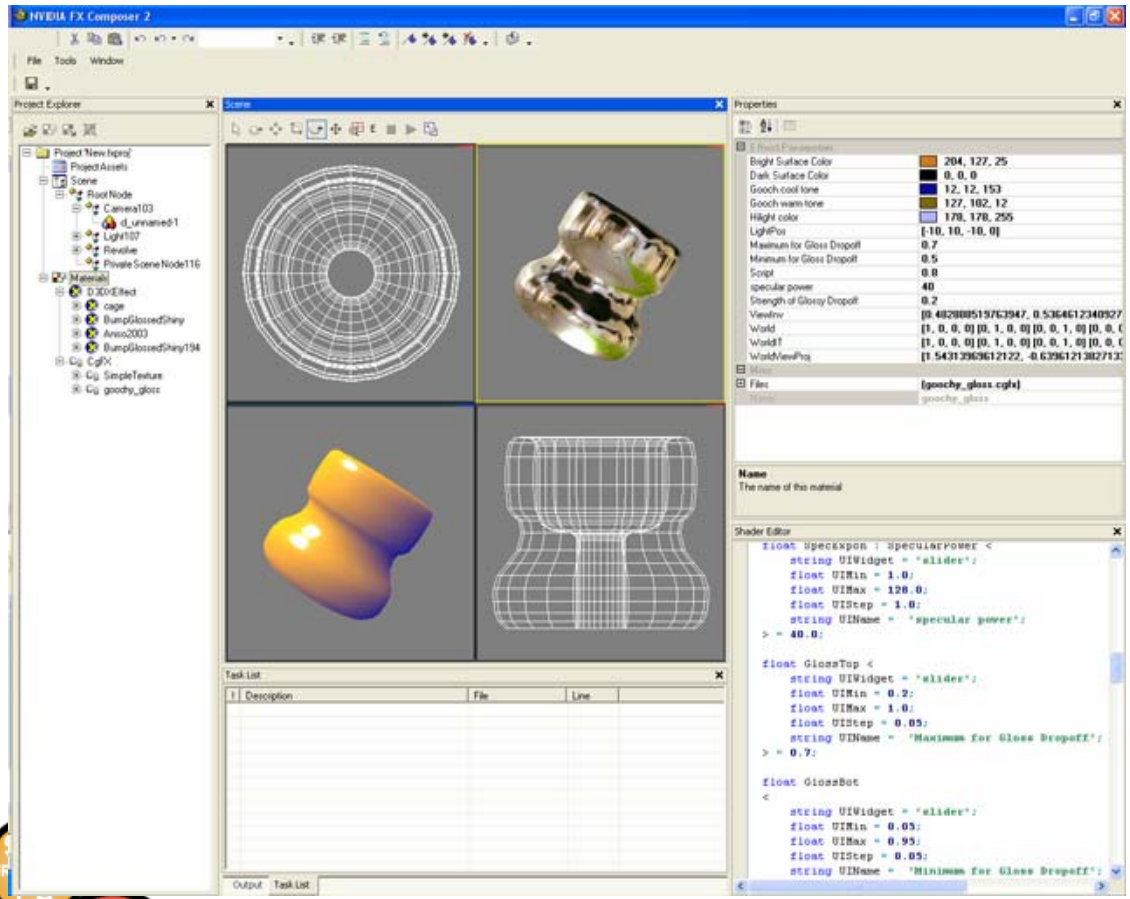
- **Examples**
  - **Import/export of scene & material data**
  - **Custom built scenes**
  - **Material parameter setting/restoring**
  - **Generation of effect files, based on data**
  - **Communication between FX Composer & your engine**
  - **Regression testing, batch processing of materials/effects**
    - **We have scripts to build screenshots of effects & projects**
    - **Other samples to copy**


new_material.fx *
sphere_scene_many.cs
export_materials_keys.cs
{
NVMaterial Mat
Scene.GetMater
// Effect path
NVString strEf
Mat.GetEffectP
writer.WriteSt
writer.WriteAt
writer.WriteSt
// Get the par
INVParameterLi
INVProperties Props = (INVProperties)Mat;
Props.GetParameterList(0, out Params);
// Write each one
for (uint ParamNum = 0; ParamNum < Params.GetNumParamet
{
writer.WriteStartElement("param");
INVConnectionParameter Param;
Params.GetConnectionParameter(ParamNum, out Param);
// Name
NVString strParamName;
Param.GetName(out strParamName);
writer.WriteAttributeString("name", GetText(strPara
writer.FooBar();
// Value
NVType Value;
Param.Get(out Value);
NVIDIA FX Composer - [PluginList.vb]
File
Edit
View
Build
Animation
Tools
Window
Help
New
Open
Import Scene...
Export Scene...
Save Package...
Save Workspace...
Package...
Workspace...
Material... Ctrl+O
Script...
File...
material.fx *
PluginList.vb
' Lists installed plugins
Imports System
Imports FXCUtil
Imports interop.nv_sys
Imports interop
Scene
Frame: 0
Perspective
Tasks
Description
D:\src\sw\devrel\SDK\MEDIA\scripts\export_materials_keys.cs: 'System.Xml.XmlTextWriter' does not con...
Script compile failed: D:\src\sw\devrel\SDK\MEDIA\scripts\export_materials_keys.cs

Soul of FX Composer 2.0

- **Major update**
  - User interface improvements
  - New engine
  - New plugin architecture
  - Device Independence
  - Platform Independence
  - Collada project files
- **Fair warning...**
  - This is still pre-alpha
  - Shipping later this year

FX Composer 2 - Screenshot



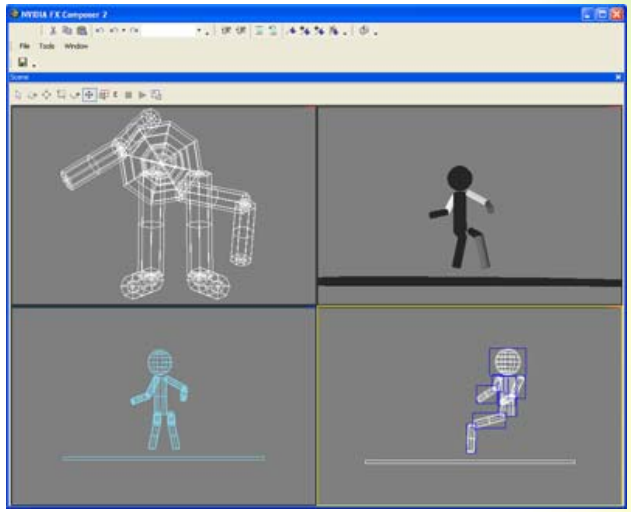
- Screenshot shows 4 Viewports, 3 are DirectX, one is OpenGL
- Also visible are the properties panel, the editor & the project browser

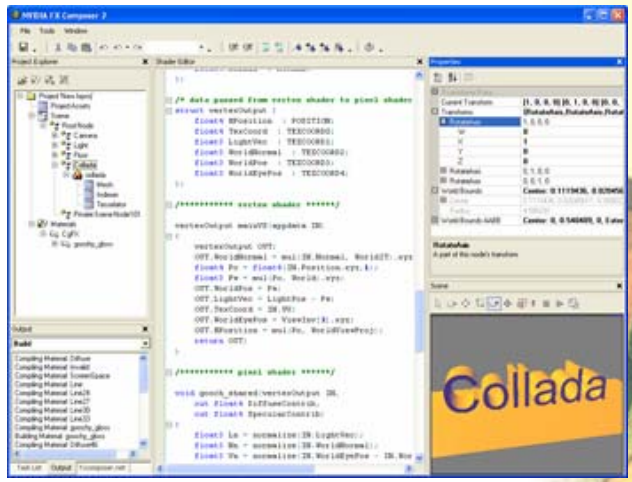
Why such a major update?

- **Improved user interface**
  - Better float dock support, plugin integration, layout management.
- **Updated engine**
  - More generalized & efficient pipeline
  - C#/.NET core
- **Multiple device and shader format support**
  - DirectX still the ‘first class’ citizen
  - Also GLSL, CgFX,…?
- **Collada project file support**
  - XNA? When it’s available…

User Interface

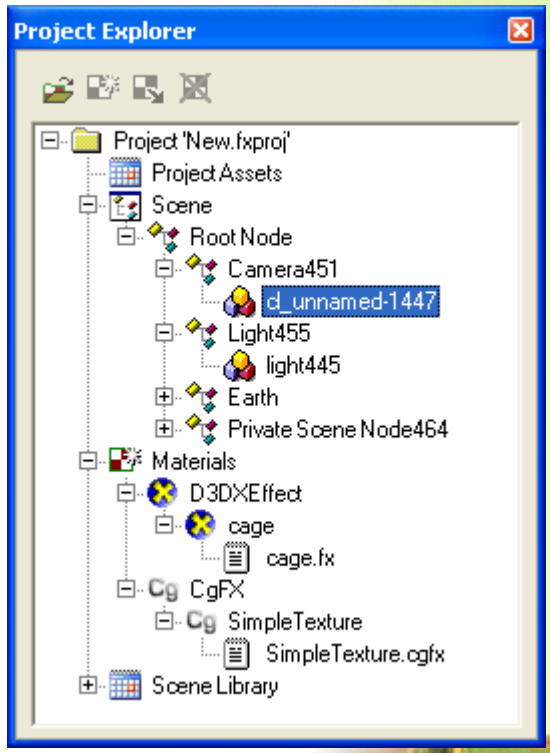
- **Supports more advanced window management**
  - Custom user layouts
  - ‘Artist’ mode, ‘Programmer’ mode, etc…
  - Doesn’t need the editor to be visible
- **Multiple viewports**
  - Each one with different device
  - Each one with different camera
    - Cameras can be shared
  - Easy viewing of same scene with different material types





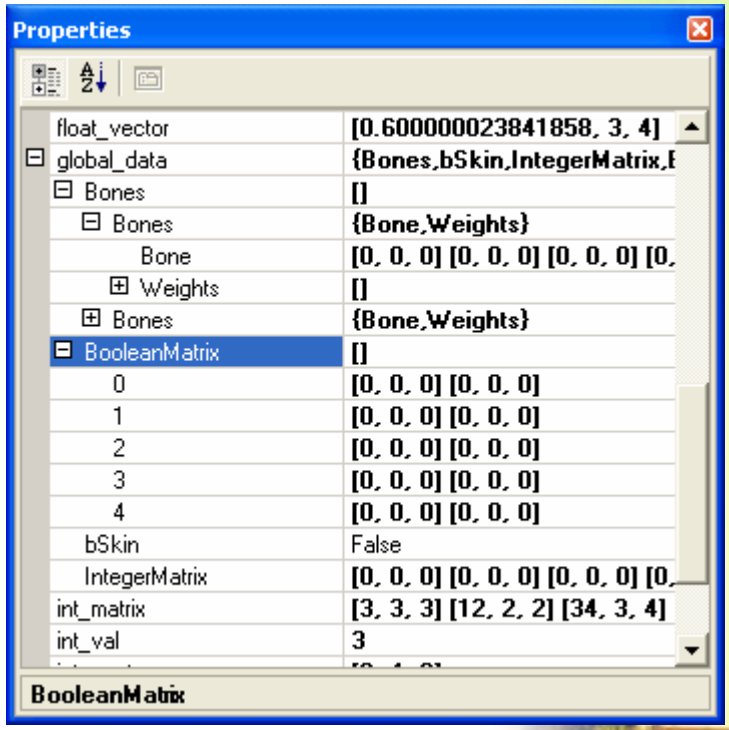
User Interface – 2

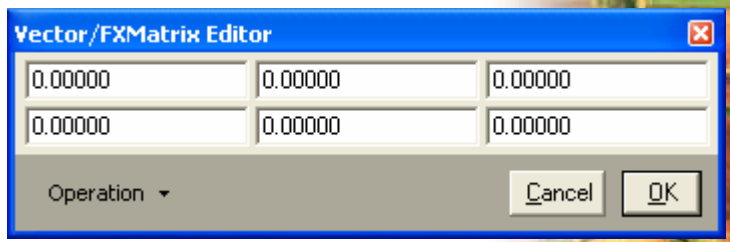
- **Project Explorer**
  - **Integration of material browser, texture browser and scene window**
  - **Control over building effects that aren't based on a metafile**
  - **Multiple material types**



User Interface – 3

- Improved property editor
  - Full support for all types
  - Structures
  - Arrays
- New widgets for editing matrices, colors, etc.



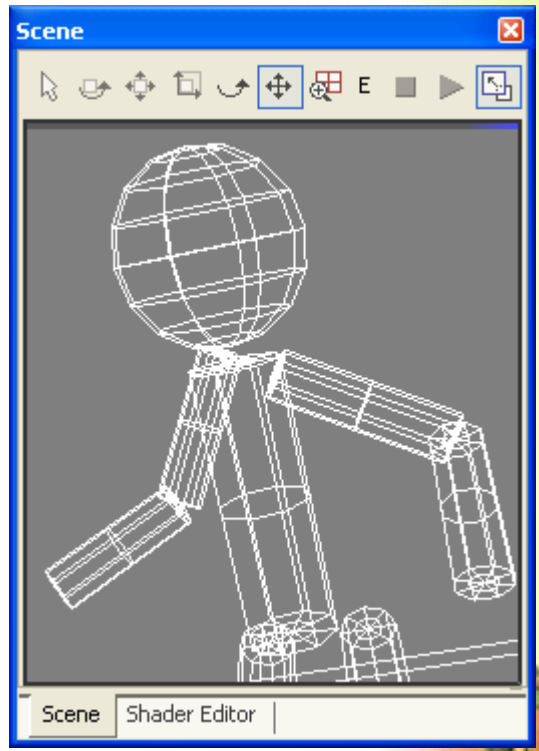


User Interface – 4

- Many usability features based on feedback
- Full drag-drop for materials, projects, tree nodes, etc.
- Better management of media files and paths
- Better management of project paths, etc.
- Still work in progress

New Engine

- **Supports n-sided polygons & multiple index sets**
  - **Needed to ensure DCC<->FXC interoperability**
  - **Tessellation to triangles before rendering**
  - **Pipeline stages can use polygon data if preferred**
- **More efficient scripting renderer**
  - **Enables DXSAS, Collada materials, etc. to run with the same core engine**

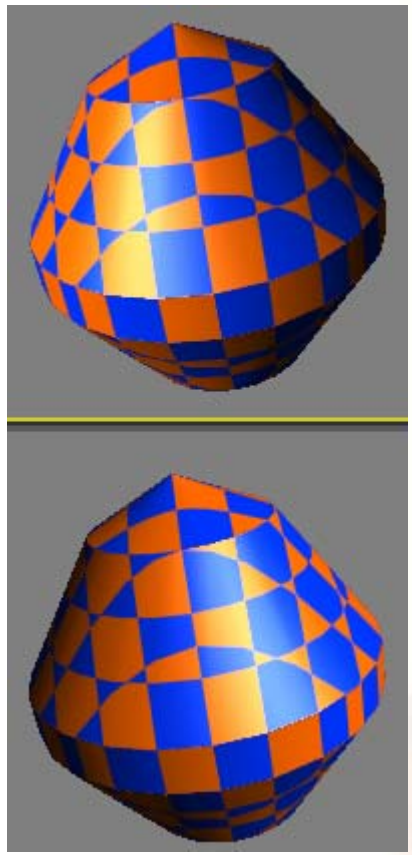


New Plugin Architecture

- Plugins now much more powerful
  - Can extend the user interface
  - Can add menu items, etc.
- Legacy plugins still supported
  - Wrapper plugin enables them to work
- Boundary between scripting and plugins more blurred
  - The same API, language
  - Can work either way

Device Independance

- Core application doesn't know or care about rendering
- All materials & devices are pluggable
  - CgFX & HLSL out of the box
  - GLSL to follow
  - SDK enables extension
    - User can implement their own device and material support
    - Works alongside existing materials in multiple viewports



Platform Independence

- FX Composer 2 is 100% .NET
- The Mono and DotGnu projects enable .NET on other platforms
  - www.mono-project.com
  - www.dotgnu.org
- Future version of FX Composer on MAC & Linux
- Watch this space!

Collada Project Files

- FX Composer 1.6 used its own XML project format
  - Proprietary, nobody liked it…
- FX Composer 2.0 can have different project formats
  - Currently Collada
  - Legacy importer/convertor provided if required for old projects

Questions?

- Suggestions, bug reports, early access
  - fxcomposer@nvidia.com
  - http://developer.nvidia.com/fxcomposer
- Me
  - cmaughan@nvidia.com

Thanks for listening...

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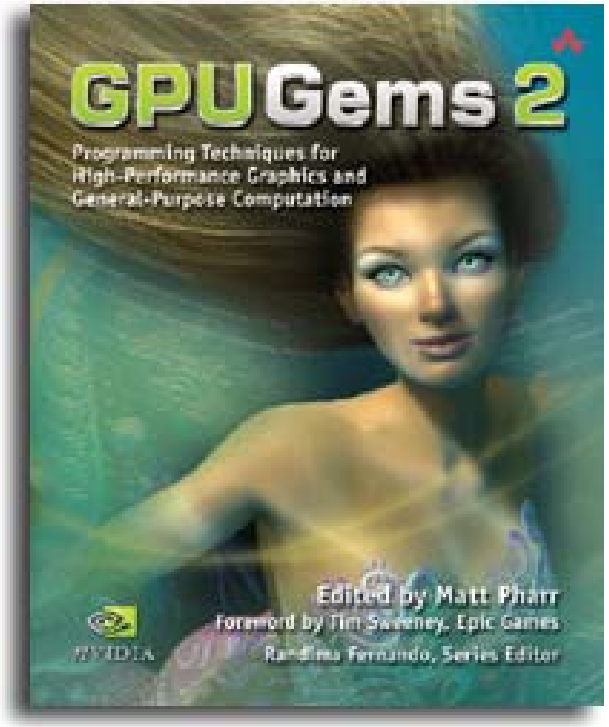

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