Autodesk®
Scaleform®

Scaleform ”A

╪ ᵘ ”A DirectX 9 ♠ ╬ Scaleform Ọ 3D ε ∫ ˘ ▓ .

: Ben Mowery
♣: 3.04
↓ ∨ : 2011 Ц 8 4 ■

Autodesk®
GAMEWARE

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1

2

3

3.1 ᾶ ᾳ 3

3.2 ᵖ ῖ ᾳ ■ 4

3.3 Scaleform Player ⁄ ᾶ SWF ᾶ Ỹ ᾳ 5

3.4 Ỵ ╪ ῖ ᾳ ■ 7

3.5 Scaleform й ╥ ⊢ ᾶ E 7

3.5.1 AS3_Global.h 파일과 Obj\AS3_Obj_Global.xxx 파일 9

4

4.1 11

4.2 w♥ ᵖ й 20

4.3 ▒ ╪ ⁄. ᾳ 22

4.3.1 22

4.3.2 24

4.3.3 25

4.3.4 26

5

5.1 ث ⁄. ¸ 27

6 C++, ,

6.1 ⁄. ⁄ ᾶ C++ 30

6.1.1 FS Command 30

6.1.2 ExternalInterface 33

6.2 C++ ⁄ ᾶ ⁄. 35

6.2.1 36

6.2.2 38

6.3 ر ■ 39

7

8 GFxExport

9

Scaleform ╪Ç ˀ ˘ ˝E ╗ Ơ ▫ ╬ ˁ ╪ (UI) Ÿ ▫ ╬ Ç ɵ ‡ ˀA
˛ ▫ ɵ ╪ Ơ ˀA ẖ ˘ ʍ ˨ GPU ʃ ╪ UI
Ự ˆ ↑ ˀE Ứ˘ ˆ ▓ . Scaleform
/ ˀA ˭ ▌ UI ꞟ Ứ˘ ˊ ˛ .

UI Ỏ ˽ ᾷ ˛ ˛ ▫ ɵ Scaleform Ơ 3D ᶜ ᶚ / ʃ ╪ ˨ ɬ ˀQ
3D ˽ Ɔ ╥ ᶜ ▓ ˭ ˝˝ . Ä 3 ˭ ▌ ᶚ ˝ 3D ɬ ⅞. Ũ ╥
UI Ỹ . ╪ Ơ ˭, 3D ɬ ⅞. Ÿ UI Ɔ / ˀA ᶜ ▓ .
˥ ˊ, Scaleform ■ UI Ỏ ˽ ᾷ ⊢ ╥ ˨ ˭ ▌ ▌ Ũ
Ł ˘ ▓ .

╪ Ԝ ╕ Scaleform ╥ ẽ ˨ Ơ / ˊ ♥ ˭ ˥ ╪ . ˝ ╥
UI Ơ DirectX ShadowVolume SDK Ỵ ˥ ╪ .

Scaleform ╪Ç ╗ ˭ ▌ ˊ ˝˝ . Scaleform ˨ ╥ ы
Scaleform ˭ ▌˘ ♪ Ơ ╪ . ╪ ᵘ ˀA ẻ ♠ Scaleform ■ ♠ ╬
˭ ▌ ˊ ˆ ↑ Scaleform ╥ / Ũ ╥ б ╥ ▫ ɵ
▬˝E ˝˝ .

╪ Ԝ ╕ / ▓ Ɔ ↻ Scaleform ╥ ˨ ♣ Ơ . ╪ Ԝ ╕
Scaleform ♣ 4 ╪Ũ / ♠ .

╪ ˀA ˆ Ÿ ˃ й Ứ . ╪ ˥ ˀA ˘ ▓ DirectX
SDK ShadowVolume й ↻ ᵘ ╪ . Ỵ й ▬ ẋ / ˃ ᶚ "Cannot create renderer" /
ʃ ˙ . ᵘ Ł / Scaleform Player ‡ ỉ ╪ ˝E ♠ ▬ ˨
▫

◗ ⎙ / … ‡ ▬ "E Scaleform ᵘ "A Scaleform ¸ ▫
(http://gameware.autodesk.com/scaleform/developer/) / "A ▓ . Ơ ╪ ⁄. ♪
∫ ╪ ▒ .

╪ ᵘ "A / ˢ Ɔ ' ⁻ .

- y Scaleform SDK ˘ ᵘ "A.
- y PDF ᵘ "A.
- y ت ⁄. ¸ : ت ⁄. ⁄. ε̈ ∫ ˘ ˜ Ł ω̣ ⁄. ' Scaleform C++ API ε̈ ♬ / ' "E Ơ Ł ̂
- y XML ¸ : SCALEFORM / "A XML ε̈ ∫
- y Scale9Grid: w ♥ ╪ , ق B ، Ỹ "E Scale9Grid ╥ Ơ ε̈ ∫
- y IME ε̈ ♬ : Scaleform ╥ IME ⎙ Ơ ▫ ‡ ǐ ╪ / ‡ ˚ ˝ ˘ / "A ■ ♠ ╬ IME ⁄. ▒ ■ ‡ ˚ ˝ Ỹ "E ε̈ ∫
- y ⁄. ◗ : Scaleform ⁄. ◗

◗ ৲ ╥ Windows Scaleform ╬ . ৷ ˘ ঃ ৲ ←
. ȝ Scaleform ╬ DirectX ‰ ╪ ⅞. ৷ ╪ . Scaleform
C:\Program Files\Scaleform\GFx SDK 4.1 Ÿ ⁄ ঃ ৲ .

╪ ॐ ’ - .

libjpeg ╪ ↑ zlib ৲ Scaleform ╪

╥ ‡ ї ╪ й ↳ Ц Ÿ ‰ \ ÀÍ¯ 3p À n ñFpÖ{ 1 • À R ’g¢ @

demo.sln ל¶ Ա Ÿ ł ⁄.. й ȝ Win32 Ÿ Э ╥
ر ■ ╪ ৷ .

Scaleform

Scaleform ╪

CLIK ї ˚ Б ⁄.. n

2 ◗ / ˝A ε ∫ PDF ᵘ ˝A

Scaleform й ╪ Ł ˆ ˜E ‡ ▒ ╬ ė [▬ Æ ᵖ ö
ÆScaleform ÆGFx SDK 4.2 ÆDemo MSVC 9.0 Solutions ÆGFx 4.2 Demos.sln] / ▒
ᵖ й . .sln ر ■ ╪ ל¶ Ա Ÿ / ˝A ȝ D3D9_Debug_Static ε ♬
ė ˘ Scaleform Player ł ⁄.. й

C:\Program Files\Scaleform\GFx SDK
4.2\Bin\Win32\Msvc90\GFxPlayer\GFxPlayer_D3D9_Debug_Static.exe ر ■ ╥ ♬ ■ ▫ ╬
Ł й ‴ ╬ .

’ [▬ Æ ᵖ ö ÆScaleform ÆGFx SDK 4.2 ÆDemo Examples ب] /
▒ Scaleform Player D3Dx ‡ ї ╪ й ‡ / ˝A SWF ╪ ‡ .
╪ n ╪ Scaleform ◓ Ỹ ⁄.. ˘ ৷ ▒

▬ Æ ᵖ ö ÆScaleform ÆGFx SDK 4.2 ÆGFx Players ÆGFx Player D3D9.

C:\Program Files\Scaleform\GFx SDK 4.2\Bin\Data\AS2\Samples\SWFToTexture ب

3D Windows.swf ‡ ĭ ╪ й .

Ỵ ǎ ʌ ╥ й ‡ ▃ Ỹ

F1 β / ' ¯ ⅞. ▫ .

1. ˜E ʌ ♬ CTRL+F ы . ▃ FPS Ł ᶜ ج Л / ↑ ϱ .
2. ╪ ‡ ▌ ᵖ й CTRL+W ы . ↓ ♠ й ‡ ▃ Ỹ
   ǎ ʌ Ù ‡ ˅ ˣ ╬ . ╪ ‡ ▌ ᵖ й
   ˍ CTRL+W ы ȝ .
3. ȝ ȝ CTRL ы ᾷ
   ╬ .
4. ╪ Ç ! ╪ ȝ CTRL ы
   ╪ .
5. ♬ Ũ ᾷ ȝ CTRL+Z ы .

6. ♣ ৷ ʒ ᵖ й ♣ CTRL+U ы .

7. ɾ ᵖ Ọ̓ Ȳ ᵉ ʃ ╥ ´ > ʒ F2 ы .

, ᵖ ̈A ৷ ˙ ė ʒ ᵐ ̈A ϟ Ọ̓ / ϟ ᶜ ▫ .
╥ ᵐ ˝ ▬ᵐ ʒ ǎ ᴎ╥ . ╥ ◗ ˩ ᴬ ↑
‡ Ʊ Ũ̓ ǎ ᴎ w ♥ ▓ ˩ ╪ . ♣ ♠╬ ⅞.. ₮
800x600 ⅞.. ₮ ' 1600x1200 ʒ ̈E⅞. .

╥ / Scaleform ˘ ▓ ৷ ৷ Scaleform ♣ ♠╬ ⅞.. ₮
. / ̈A ᵣ ɵ ▓ ‡ Ɛ ǎ ᴎ Scaleform

"3D Scaleform Logo" Ÿ , ˘ CTRL+W ╪ ‡ ▌ᵖ й ♣ .
╪ Ù̓ ‡ ▓ ৷ / ϟ ᶜ . CTRL+A ц ы ʒ Ȯ ö ‡
ᵖ й ♣ . Edge Anti-Aliasing ᵖ й (EdgeAA) / ̈A, ᴎ ̈A Ù̓ ᵖ ̈A /
ᴎ Ȯ ö ‡ ' Ỹ ̈E . ╪ Ÿ ˩ й AA╥ Л ╥ ▌
ᵐ Ÿ ɾ ᵖ Л ╥ ♣ ৷ ʒ Ȯ ö ‡
(FSAA) ' ♠╪ . ǐ ■ᵗ╥ ˘ ╬ EdgeAA Ȯ ö ‡ ■ ♠
/ ᵖ ̈A ⅞.. ⁻ ╪ ╪ ◗ ◗ ᵘ ╪ ▓ / ᵣ Ȯ ö ‡
♠ ₋ ৷ ╥ ⅞..̈E ╪ . Ù̓ ╥ ‡ ↑ draw primitive (DP)╥
■♬ ᵐ ৯ ᵘ / ̈E ' . ╪ ৷ Ÿ ˩ й╥ Ȯ ö ‡
Ọ̓ ৷ ■ ♠ ৯ ♠╪ ę EdgeAA ǰ ɛ̈ ♬ Ọ̓ ˅ ↑
Ȳ╥ w▬╪ .

Scaleform Player n ǎ ᴎ╥ Ÿ ' ̈E ᴎ / . ▬‰ ' ▫
CPU Ọ̓ ╬ . CPU Ọ̓ Scaleform ᴎ ᶜ ♠ ৷ ᵘ ╥
▌ ৯ ᵘ / и ᵐ ↑ ▓ . CTRL+Y ы ʒ ▌ ╪⅞.. ʒ
ᵢ ϟ (■ ♠ ৷ 60 ▌) ˘ ♬ . CPU Ọ̓ ╪ ˝ ᵐ ᶜ ╬
▓ .

▫ ╥ ‡ ǐ╪ ᴎ ৯ Scaleform Ÿ й ৷ ♠ ̈E Ɫ̂ Ω
৯ ᵘ / й ৷ .

Scaleform 4.2 Ơ ▫ Scaleform\GFx SDK 4.2\Apps\Tutorial ˬ / ▓ Tutorial Solution
. ▬ ʃ Ɔ Scaleform ÆGFx SDK 4.2 ÆTutorial / ˝A ㄴ˥ ԾŸ 2005
2008 ╬ ▓ . ǂ ⅞. ë ♬ ╪ “Debug” ‡ ▓ ╬
‡ ǐ ╪

UI ▓ ShadowVolume ‡ ǐ ╪

Ự Scaleform ǂ ⅞. Ỹ ˜E ২, ï ر ■ ♣ ㄴ˥ ԾŸ / ˝A ë ♬ ц
Ơ ╪ ▓ . ԾŸ / ۿ ╥ ´ ƒ ২ ˘ ▓ Ư ˬ ╪Ç ˘˘ ▓ .
$(GFXDSK) SDK ë ∧ Ÿ / ˝A ♬ ╥ ˬ ▌ ㄴ . ∧
C:\Program Files\Scaleform\GFx SDK 4.2\╪ . ˭ – ╪ ∧ / ▓ ȝ Ư /
▓ ╪ ╥ ∧ ♬ $(GFKSDK) ˬ ▓ . ╪ / ė
“Msvc90” Ơ . ㄴ˥ ԾŸ 2008 ˝ 2010 Ơ ▫ ╬ ˬ Msvc90 ˝
Msvc10 Ơ ▓ .

Scaleform ł ⅞.. ╥ Ÿ й ё♬ / ̈A include ← / ⅄ .

$(GFXSDK)\Src

$(GFXSDK)\Include

╥ Ɔ ↳ ↳ Ц Ÿ “Additional Include Directories” ᶜ / K .

ă … (GFx.h) ˚ ‡ ▒ Ώ ← , AS3 Ọ ˘ ▒ ȝ AS3

Ў ر ■ “GFx/AS3/AS3_Global.h” / ♪ ё ⅄ . ¸ ▫ ╪ ر ■ / ̈A

♪ AS3 Ł ▒ . ▫ ̈E Ɔ Scaleform LITE Ọ ▫ ♬ ╥

ᵘ ̈A w .

Ÿ й ё♬ ╪ Ÿ ă ˢ ṵ ← / ⅄

$(DXSDK_DIR)\Lib\x86

$(GFXSDK)\3rdParty\expat-2.1.0\lib

$(GFXSDK)\Lib\$(PlatformName) \Msvc80\Debug_Static\

$(GFXSDK)\3rdParty\zlib-1.2.7\Lib\$(PlatformName) \Msvc90\Debug

$(GFXSDK)\3rdParty\jpeg-8d\Lib\$(PlatformName) \Msvc90\Debug

Ɔ “Additional Library Directories” ᶜ / K .

"$(DXSDK_DIR)\Lib\x86";

"$(GFXSDK)\3rdParty\expat-2.1.0\lib";

"$(GFXSDK)\Lib\$(PlatformName)\Msvc90\debug";

"$(GFXSDK)\3rdParty\zlib-1.2.7\Lib\$(PlatformName)\Msvc90\Debug";

"$(GFXSDK)\3rdParty\jpeg-8d\Lib\$(PlatformName)\Msvc90\Debug"

Msvc90 ё ⅄ ↳ Ц Ÿ ♣ / ♠ ᵘ ▫ .

й ё♬ / ̈A ’ ╪ ă ˢ ṵ ← / ⅄ – :

$(DXSDK_DIR)\Lib\x86

$(GFXSDK)\3rdParty\expat-2.1.0\lib

$(GFXSDK)\Lib\$(PlatformName)\Msvc90\Release\

$(GFXSDK)\3rdParty\zlib-1.2.7\Lib\$(PlatformName)\Msvc90\Release

$(GFXSDK)\3rdParty\jpeg-8d\Lib\$(PlatformName)\Msvc90\Release

Ɔ “Additional Library Directories” ᶜ / K (ر ■ ё♬).

"$(DXSDK_DIR)\Lib\x86";
"$(GFXSDK)\3rdParty\expat-2.1.0\lib";
"$(GFXSDK)\Lib\$(PlatformName)\Msvc90\Release";
"$(GFXSDK)\3rdParty\zlib-1.2.7\Lib\$(PlatformName)\Msvc90\Release";
"$(GFXSDK)\3rdParty\jpeg-8d\Lib\$(PlatformName)\Msvc90\Release"
"$(GFXSDK)3rdParty\libpng\Lib\$(PlatformName)\Msvc90\Release"

Msvc90 ß ㅅ ¶ ㄴ Ÿ ♣ / ♠ ᴗ ▫ .

¡ Scaleform ╪ ╥ ⊢ ¨E ㄱ .

libgfx.lib
libAS2.lib
libAS3.lib
libgfxexpat.lib
libjpeg.lib
zlib.lib
libpng.lib
libgfxrender_d3d9.lib
libgfxsound_fmod.lib

■ ╪ ㄹ ■ й ˆ ¨E / ㄱ .

Ÿ ß ♬ ᵖ / ¨A Y ‡ ǐ ╪ ǐ ㄹ ■ ˘ ˩ • .
˘ , Scaleform include ♬ . vcproj ㄹ ■' ǎ ß ♬ ╪ Tutorial/Section3.5 ㅂ /
↑ ▓ .

파일과 파일

AS3_Global.h Obj₩AS3_Obj_global.xxx ㄹ ■ ╪ ˩ /
ㄴ ᶜ .
AS3_Obj_Global.xxx ㄹ ■ " " ActionScript 3 _ ㅅ ˘ _ ㅅ ╥ ˆ ˚ .
ᵖ ö swf ㄹ ■ ㄴ ↑ ╪ Ũ ╥ " ˊ." _ ㅅ (_ ㅅ) ˚ . C++ ˆ
ᵖ ö _ ㅅ ╬ GlobalObjectCPP ▓ . ╪ Scaleform VM
ˆ / ʳ .

AS3_Global.h ♣ ˢ ♠ Ọ̈ . ╪ ر ■ ClassRegistrationTable
ˁ . ╪ AS3 ˆ C++ w ˢ ♠ Ọ̈ .
╪ w ′ ȝ ő й Ł ↿ ▒ . ḃ ر ■ Ɔ / Ä й
ClassRegistrationTable ♬ ╥ – . Ώ ȝ ő / Ỹ ↿ ▒ . ╪
╪ ᵖ ╪ ‡ AS3_Global.h ˁ .

Ọ̈ ▫ ClassRegistrationTable ˂ ȝ (й ⊓ ╪ ȝ)
ClassRegistrationTable ˁ include ر ■ ˁ – . ◗ ↓
AS3_Global.h ╥ Ọ̈ ʳ ө˘ ′ ㄴ Ä ㄴ Ł
/ ˁ ↿ ▒ . ╪ ˣ Ł Ọ̈ Ώ .

ʳ ╪ ㄴ ♠ ’ ’ Ω̣ ω̃ – ↿ ╪ ▓ . AS3 VM / Ä ╪ Ä
▌/ ḃ ㄴ Ä ㄴ ‡ ╪ / Ä Ł ˂ ╪ ㄱ
▓ . ƒ Ä " " ọ̈ Ł ╪ Ł ▬ Ç
╬ .

Scaleform Unreal® Engine 3, Gamebryo™, Bigworld®, Hero Engine™, Touchdown Jupiter Engine™, CryENGINE™ Trinigy Vision Engine™ [illegible]

[illegible]

[illegible]

[

ر ■ ShadowVolume.cpp / ⅄ .

```
#include "GFx_Kernel.h"
#include "GFx.h"
#include "GFx_Renderer_D3D9.h"
```

Ÿ ц Scaleform _ ⅄ ę GFxTutorial ‡ ĭ ╪ /
⅄ Ự Ɔ / ⅄ ⁼ . ↑ ╥ / Scaleform Ũ
K ‡ ȝ й ϟ ⁼ ᵣ ɵ Ỏ ᵣ ᾧ ợ Ł ⅄ ᵇ ö
Scaleform _ ⅄ j ▓ ◗ ⅈ ╪ ▓ . ╪ _ ⅄ Ợ ╪ ╥ Ũ ▬
/ ˝A Ũ ˝E ǧ ↿ ╪ .

```
// One GFx::Loader per application
Loader          gfxLoader;

// One GFx::MovieDef per SWF/GFx file
Ptr<MovieDef>   pUIMovieDef;

// One GFx::Movie per playing instance of movie
Ptr<Movie>  pUIMovie;

// Renderer data
Ptr<Render::D3D9::HAL>  pRenderHAL;
Ptr<Render::Renderer2D> pRenderer;
MovieDisplayHandle     hMovieDisplay;
```

Scaleform ↿ ╥ ⅄ ´ Scaleform ɾ ᵇ
' GFx::System ǂ ⅞. ↿ ╪ . WinMain / й ⅄ .

```
// One GFx::System per application
GFx::System         gfxInit;
```

GFx::System ǂ ⅞. й ⅄ Scaleform ⅄ ♣ / / ɵ ‡ ▓ ‡ – ę
Scaleform Ợ ‡ ĭ ╪ ⁻ ♣ Ʊ ↑ ˝A Ỏ . ╪ ↿
WInMain Ỏ / ▓ ↄ ᵘ ╪ . ˝A ↿ GFx::System Scaleform ɾ ᵇ
ᵇ Ợ . ↑ ‡ ĭ ╪ ╥ ᾶ ɾ ᵇ ᵇ ╪ й
. ╪ ˝A ╥ ᶜ ♠ Ũ ⁼ GFx::System ↿ ȝ ↄ ᵘ /
˝A ╪ ♬ ⅄ ᵇ .

GFx::System й ‡ ╬ ╬ ♣ / / Ä ‡ ↑ – .
ƒ Ä, й ♣ ■ ' . ╬ GFxTutorial ╬ Ł ♣ /
‡ j ┤╬ .

‡ ¯ ╬ ╥ w / ƒ ° r , GFx::System::Init()' GFx::System::Destroy()
♬ ♠ ∧ ┤╬ GFx::System _ ∧ ╬ r й ┤ ┤╬ .

↑ ʉ Scaleform ┤ InitApp() Ɔ / Ä ‡ ╬ ╥ WinMain╬ ▫ ∧ ♠
┤ ■ ‡ ϱ . ∧ ϖ ¯ й InitApp() / ∧

```
gfx = new GFxTutorial();
assert(gfx != NULL);
if(!gfx->InitGFx())
   assert(0);
```

GFxTutorial GFx::Loader _ ∧ ˚ ˘ ▒ . ■ ♠ ‡ ╬ ↑ ╥
GFx::Loader _ ∧ ˘˘ ▒ ę ╬ _ ∧ SWF/GFx ď ∧ ╥ ы' ď ∧
▫ ╬ / ℙ ◗ ę ╬ w / ▫ ☁ Ọ'
▒ ⁼ . ╥ SWF/GFx ر ■ ╬ Ç ت ٪ ¯ ▫ ˆ Ω ƒ ▫
♥ – ▒ . GFx::Loader ˝ Ÿ / Ọ' GFx::Log ¯ ■ ╥
ε̈ ♬ Ũ'

GFxTutorial::InitGFx() / Ä ∧ ´ GFx::Loader / Ũ' ε̈ ♬ ┤╬ .
GFx::Loader SetLog Łˆ ɵ Ÿ ∧ ♠ ♬ ♣ . ╥
Scaleform Ỹ ╬ / ∧ ʊ ʊ / Ÿ / ʉ
. ╬ / Scaleform PlayerLog ɵ Ọ' , ╬ ɵ
ƒ / ∧ . r ⁼ ▌ ╥ Ÿ ' ╥
GFx::Log Ũ' ˆ Ä r ɵ ▒ ┤╬ .

```
// Initialize logging -- Scaleform will print errors to the log
// stream.
gfxLoader->SetLog(Ptr<Log>(*new Log()));
```

GFx::Loader GFx::FileOpener ď ∧ ■ . ˆ / ε̇
Ÿ ر ■ ■ r ƒ ▫ ˝ ▫ ر ■ ╥ Ọ' ▫ ы
GFx::FileOpener Ũ' ʒ .

```
// Give the loader the default file opener
```

```
Ptr<FileOpener> pfileOpener = *new FileOpener;
gfxLoader->SetFileOpener(pfileOpener);
```

Render::HAL [illegible] Scaleform [illegible] D3D9 [illegible] D3D [illegible] Scaleform [illegible] HAL::InitHAL / Render HAL [illegible] IDirect3Device9 [illegible] Scaleform DX9 [illegible] UI [illegible]

```
pRenderHAL = *new Render::D3D9::HAL();
if (!(pRenderer = *new Render::Renderer2D(pRenderHAL.GetPtr())))
  return false;
```

[illegible] Scaleform [illegible] Render::D3D9::HAL [illegible] Render::HAL [illegible] Scaleform [illegible]

[illegible] GFx::Loader [illegible] GFx::MovieDef [illegible] GFx::MovieDef [illegible]

```
// Load the movie
pUIMovieDef = *gfxLoader.CreateMovie(UIMOVIE_FILENAME,
                                     Loader::LoadKeepBindData |
                                              Loader::LoadWaitFrame1, 0);
```

LoadKeepBindData [illegible] D3D [illegible]

LoadWaitFrame1 [illegible] CreateMovie [illegible] GFx::ThreadedTaskManager [illegible]

[illegible] (Arena) [illegible] Memory System Overview [illegible]

[illegible] GFx::MovieDef [illegible] GFx::Movie [illegible] [illegible] .
GFx::Movie [illegible] [illegible] [illegible]

Render::D3D9::HAL::InitHAL ╱ ♣ ę, D3D Ÿ ╪ Ỹ ̈E ╪♣,
Scaleform ╲ ╪♣ ╱ ╲ . D3D Ÿ ╪ ɵ╪ ̧ ȝ
InitHAL ╲ – ę ╪ w♥ ̋ ♣╲ ȝ╱ ᵖ й ̧ ╱
Ỹ ▓ .

ShadowVolume ╥ OnResetDevice DXUT ╱ ╥ ̈A ┤ Ÿ ╪ Ỹ ̈E ,
˘ Ÿ ╪ ╱ ╲ . й GFxTutorial Ɔ ╥
OnResetDevice ʃ й ╱ ┤ ‴ .

```
pRenderHAL->InitHAL(
    Render::D3D9::HALInitParams(pd3dDevice, presentParams,
                                Render::D3D9::HALConfig_NoSceneCalls));
```

InitHAL ╲ Scaleform ╱ D3D ◗╲ ♬ ♣ .
HAL_NoSceneCalls DirectX BeginScene() EndScene() ╲╪ Scaleform
╪ Ω ┤╪ . ╪ ShadowVolume Ỵ ╪ OnFrameRenderer
╱ ̈A ╪ɵ ╲ ╪Ç ˘ ▓ ᵕ ᵘ ╱ ┤╪ .

w♥ ˗ ↑ ‡ ̈ї╪ ♣╲ ȝ ♣ ̧ , D3D Ÿ ╪
٪ ┤╪ . ♬ ♩ ̧ ╲ ̊ ᵖ ö D3D ̈A ┤ –
. ShadowVolume OnLostDevice ╱ ̈A ̈A Ł . Render::HAL ╱
٪ Ÿ ╪ ╱ ' Ɔ Ω ϟ ȝ GFxTutorial Ɔ OnLostDevice ╱ ̈A D3D
▫ Ł ϟ ̄ .

```
pRendererHAL->ShutdownHAL();
```

╪ ´ ╪♣ ´ DXUT ▌ ╥ ┤
٪ Ÿ ╪ ̈ɛ ʃ ┤╪ . Win32/DirectX ╱ Ł
Scaleform SDK ╱ ̈A Łˆ GFxPlayerTiny.cpp ر ■ ˘ ▫ .

ᵖ ö Scaleform _╲ GFxTutorial _╲ Ɔ╱ ̊ ‡ ▓ ᵕ ᵘ ╱ ╲ WinMain ╥
¡ ╱ ̈A GFxTutorial _╲ ϱ Ł ┤ ʳ .

```
delete gfx;
gfx = NULL;
```

˘ Ọ̈ ♬ ♩ ˭ ˉ DirectX 9 ▫ ╥ ∖ . Scaleform
╪ ˽ ↳ ʃ ╬ ˭ ▌ ⅄ / Ỹ ∖ / ˝A InitHAL()
ShutdownHAL() ‡ Ɛ ╪ ↿ ╪ ⅄ .

DirectX9 ˆ / ˝A InitHAL ♬ ♩ ˭ ˚ D3DPOOL_DEFAULT ▫ .
' ↄ ∧ D3DPOOL_DEFAULT ' ▫ ˚ / ˝A
InitHAL ∧ .

ShutdownHAL D3DPOOL_DEFAULT ▫ Ł . ShadowVolume ˚ ˝A
DXUT ▌ Ọ̈ ‡ ╪ DXUT OnResetDevice / ˝A
D3DPOOL_DEFAULT ▫ – ę OnLostDevice / ˝A Ł – .
GFxTutorial::OnLostDevice Ɔ ╥ ShutdownHAL ∧ GFxTutorial::OnResetDevice Ɔ ╥
InitHAL ∧' ╪ .

' ˽ D3DPOOL_DEFAULT ▫ Ỹ ˝E ˗ ↑ Ł ʒ
∧' InitHAL ShutdownHAL ∧ .

∫ Ũ / ˝...♬ ˚ ˝.. й . ╪ ˽ /
♣ ∨ ♩ ˘ ▒ . ʒ Ũ ˽ ↳ ᵘ / D3D Ÿ ╪
↳ ˚ ˝.. GFxTutorial::OnResetDevice / й
∧ .

```
// Use the window client rect size as the viewport.
RECT  windowRect   = DXUTGetWindowClientRect();
DWORD windowWidth  = windowRect.right - windowRect.left;
DWORD windowHeight = windowRect.bottom - windowRect.top;
pUIMovie->SetViewport(windowWidth, windowHeight, 0, 0,
                      windowWidth, windowHeight);
```

SetViewport╥ ∧ ˛ ╥ ♯ ˛ Ọ̈ ▌ ˭ ╥ (■ ♠ PC
‡ ╪) ♬ ╥ . / ↑ Л ˛ ╥ ♯ ˛
Scaleform ▌ ˭ Ɔ ╥ ˚ ˝.. ♬ ╥ .

▌ ˭ ♣ ╬ ▫ OpenGL' ╥ ˝E, ! ⅇ Ọ̈
, ▌ ˭ Ω ' ↳ ȳ ╥ ╪ .

Scaleform ğ ⅄ ╥ ˜ ♬ ˘ ˚ ⅓ Ɔ / ‡ ˙ ˝ ⅄ ┤ ╬ /
’ Ł ̂ . ‡ ĭ ╪ ╥ ┐ ⅄ 4.2 / ̈A ╪ /
’ ┤ ╪ .

ShadowVolume ╥ OnFrameRender() / ̈A ╪ ╪ . ᵖ ö D3D
⅄ BeginScene()’ EndScene() ⅄ Ơ ╪ / ̈A ╪ . / ė EndScene()
╪ ♣ / GFxTutorial::AdvanceAndRender() ⅄ .

```
void AdvanceAndRender(void)
{
      DWORD mtime = timeGetTime();
      float deltaTime = ((float)(mtime - MovieLastTime)) / 1000.0f;
      MovieLastTime = mtime;

      pUIMovie->Advance(deltaTime, 0);
      pRenderer->BeginFrame();

      if (hMovieDisplay.NextCapture(pRenderer->GetContextNotify()))
      {
          pRenderer->Display(hMovieDisplay);
      }

      pRenderer->EndFrame();
}
```

Advance deltaTime ┤ ˩ ∫ ◓ Ỹ . ∫ ╥ ◓ Ỹ ◓
┐ ‡ ĭ ╪ Ł ‡ . ̈A ⅄ ‡ ẽ ♬ / ̈A ∫ Ł
◓ Ỹ ╬ Ł GFx::Movie::Advance / Ł ̂
┤ ╪ ⅄ .

Render::Renderer2D::Display D3D Ÿ ╪ / ̈A ∫ ▌
DirectX ⅄ . ̈E Ũ ╥ ╪ ы ᵖ й ⅄ ᵖ ◗ ẽ ♬ ᵖ ◗
Ω . ƒ ̈A, D3D Ÿ ╪ Ũ Render::Renderer2D::Display ⅄ /
▓ . ╪ ╬ ц ц ‡ ĭ ╪ O ▓ . ◗ ♪ ♠ ╬ ˩
Display ⅄ ╪ ♣ / Ÿ ╪ Ũ ᵖ ◗ ˘ ↑ ⅄ / ╪ ̂ ┤ ╪ . Scaleform
Ũ ˝ ▌ ◓ ┤ ̈Ω ↑ ̈E ˥ ▓ .
╪ ̈A / ̈A DX9 ╥ Ũ Ơ ̈A ˝ Ũ ᵖ ◗ ˘
̂ .

DX9 Ũ‡ ĭ╪ ╪▬ ẋ╬ Ȯ ę
GFxTutorial::AdvanceAndRender() ⅄ Ö / Ọ .

```
// Save DirectX state before calling Scaleform
g_pStateBlock->Capture();
// Render the frame and advance the time counter
gfx->AdvanceAndRender();
// Restore DirectX state to avoid disturbing game render state
g_pStateBlock->Apply();
```

¡ ´ DXUT ╥ UI Ọ ¡ ┤╪ . ╪ ий╥ ' ăʃ ⅞..
⅄ Ẓ╪ ę ⅄ ¨ ' Section4.1\ShadowVolume.cpp / ↑ ▓ .
╪♩ ╪♣ ий ¬ . DXUT ' ᵇ ö ← ╬ ▫ .

```
// Disable default UI
..
```

╪Ł DirectX ‡ ĭ╪ / Ẓ ий ‡ ʃ ⁼ ┤╪ .

Scaleform ╥ UI ▓ ShadowVolume ‡ ĭ╪

GFx::Movie::SetViewport [illegible] Scaleform [illegible]

[illegible]

[illegible] 4:3' [illegible] Scaleform [illegible] 800x600 [illegible] 1600x1200 [illegible] Scaleform [illegible]

GFx::Movie::SetViewScaleMode [illegible] GFxTutorial::InitGFx() [illegible] GFx::Movie [illegible]

```
pUIMovie->SetViewScaleMode(Movie::SM_ShowAll);
```

[illegible] SetViewScaleMode [illegible]

SM_NoScale	[illegible]
SM_ShowAll	[illegible]
SM_ExactFit	[illegible]
SM_NoBorder	[illegible]

[illegible] SetViewAlignment [illegible] SM_NoScale [illegible] SM_ShowAll [illegible]

SetViewAlignment ˋ ⅞ Ɔ / ̈A ǎ ʌ ‡ Ÿ / й ˉ ♬ . ╪ ← ╬ ˊ ╪
， ȝ ↓ ʌ ẋ / й ѿ – .

```
pUIMovie->SetViewAlignment(Movie::Align_CenterRight);
```

w ♥ ↄ ‡ ǐ ╪ ⅞..˝E╪ ‡ ˇ ˝
SetViewScaleMode SetViewAlignment╥ Ɔ ← ▫ .

SetViewAlignment SetViewScaleMode SM_NoScale > ȅ ♬ ←
Ł ˘ ‡ Ʊ ϟ Ω . ○ ♬ , w ♥, ʌ w ♬ ȳ ╥ ˆ Ọ / Scaleform ∫ ▫ ╥ ʌ ė ▓ ⅞ ◗ . Ỵ ⅞ d3d9guide.fla / ▓ .

♬ ₨ ¸ C++╪ ѿ ⅞ ȅ ♬ ╪ . SetViewScaleMode SetViewAlignment ⅞ Stage (Stage.scaleMode, Stage.align) Łˆ ■ ˝E > ♬ .

ShadowVolume ╥ ╪ ╫╪ Scaleform ♬ ‴ ⸮ ⸮ /
╪ Ł ▃ Ỹ ⸮ ╫ Ũ ▬ ▫ . ɵ ‡ ˝A ، ╪
ˬ ╪ ╪ ٪ Ỹ ˘ ٪ Ũ ▫ / ▫ ▒ ȝ Ụ ▫ † †
ˡ ╪ .

The GFx::Movie::HandleEvent ˝ ! ج - ╪ ٪ ▒ ♬
† Ɔ GFx::Event _ ৷ ♣ . ‡ ˝ˡ ╪ ▒ / ╪ ٪ ˆ ˜E ˝A ╪
♠ ♥ GFx::Movie ♣ .

ShadowVolume MsgProc / ˝A Win32 ▒ ╪ ٪ . Scaleform ╪ ٪
৷ й GFxTutorial::ProcessEvent / ৷ . й
WM_MOUSEMOVE, WM_LBUTTONDOWN WM_LBUTTONUP ৷ :

```
void ProcessEvent(HWND hWnd, unsigned uMsg, WPARAM wParam, LPARAM lParam,
                  bool *pbNoFurtherProcessing)
{
 int mx = LOWORD(lParam), my = HIWORD(lParam);
 if (pUIMovie)
 {
        if (uMsg == WM_MOUSEMOVE)
        {
               MouseEvent mevent(GFx::Event::MouseMove, 0, mx, my);
               pUIMovie->HandleEvent(mevent);
        }
        else if (pMovieButton && uMsg == WM_LBUTTONDOWN)
        {
               ::SetCapture(hWnd);
               MouseEvent mevent(GFx::Event::MouseDown, 0, mx, my);
               pUIMovie->HandleEvent(mevent);
        }
        else if (pMovieButton && uMsg == WM_LBUTTONUP)
        {
               ::ReleaseCapture();
               MouseEvent mevent(GFx::Event::MouseUp, 0, mx, my);
               pUIMovie->HandleEvent(mevent);
        }
 }
}
```

Scaleform [illegible]

#1: [illegible]

```
pMovie->SetViewport(screen_width, screen_height, 0, 0,
                                screen_width, screen_height, 0);
```

[illegible] (0, 0) [illegible]

#2: [illegible]

```
pMovie->SetViewport(screen_width, screen_height, 0, 0,
                                screen_width / 4, screen_height / 4, 0);
```

[illegible] HandleEvent [illegible]

#3: [illegible]

```
movie_width  = screen_width / 6;
movie_height = screen_height / 6;
pMovie->SetViewport( screen_width, screen_height,
                     screen_width / 2 – movie_width / 2,
                     screen_height / 2 – movie_height / 2,
                     movie_width, movie_height);
```

[illegible] (0, 0) [illegible] (screen_width / 2 – movie_width / 2, screen_height / 2 – movie_height / 2) [illegible]

[illegible] GFx::Movie::SetViewAlignment [illegible] GFx::Movie::SetViewport [illegible] SetViewAlignment [illegible] SetViewScaleMode [illegible] Scaleform [illegible]

й ╪ ⅞ GFx::Movie::HandleEvent ч . GFx::KeyEvent GFx::CharEvent
ϰ ╪ ⅞ ▓ .

```
KeyEvent(EventType eventType = None,
                  Key::Code code = Key::None,
                  UByte asciiCode = 0,
                  UInt32 wcharCode = 0,
                  UInt8 keyboardIndex = 0)

CharEvent(UInt32 wcharCode, UInt8 keyboardIndex = 0)
```

GFx::KeyEvent ˄ й Ọ ˇ , GFx::CharEvent ч ASCII ᵘ ▫ Ọ .
/ ˝A GFx::CharEvent WM_CHAR ɾ / Ỹ ˝E . GFx::KeyEvent
WM_SYSKEYDOWN, WM_SYSKEYUP, WM_KEYDOWN WM_KEYUP ɾ /
Ỹ ˝E . ц ö ↿ ╪ .

- SHIFT ы Ũ / ˝A ʻcʼ ы : WM_KEYDOWN ɾ /
  GFx::KeyEvent Ỹ ˝E ‡ – ę ' ⁻ Ɔ Ω ⊓ ↿ ╪ .
  - ʻcʼ ˇ , ╥ ˄ й
  - ы ˇ ▓ . ˇ
  - SHIFT ▬ ϰ ╪ .

- ╪ / ″ ч ϱ ″ ASCII > ʻCʼ Scaleform ♣ WM_CHAR /
  GFx::CharEvent ‡ – .

- ʻcʼ й ˄ WM_KEYUP ɾ / GFx::KeyEvent Ɔ – .
  й ˄ GFx::CharEvent Ъ ′ .

- F5 ы : ы ϖ GFx::KeyEvent Ɔ ę ϖ ╪ ⅞
  Ë . F5 ϧ ASCII й / Ω ϖ ᵘ / GFx::CharEvent Ъ
  ′ .

╥ GFx::KeyEvent ╪ ⅞ ы ˇ ˢ ╪ ⅞ ♣ . ⁻ / ♠
▬ , й GFx_Event.h ر ■ / ˝A ♬ ╥ Ɔ ♠ Ọ
й ϩ ⅄ . GFxPlayerTiny.cpp Scaleform Player ă ˄ й

й й ˅ ▓ . ╪ ◗ / ˝A ╥ ¡ й ő 3D
’ ৲ ▲ Ọ ╪ ProcessKeyEvent ˅ ▓ .

```
void ProcessKeyEvent(Movie *pMovie, unsigned uMsg, WPARAM wParam, LPARAM
lParam)
```

╥ WndProc / ˝A ˘ WM_CHAR, WM_SYSKEYDOWN, WM_SYSKEYUP,
WM_KEYDOWN, WM_KEYUP ɾ / ৷ . ♠ ♥ Scaleform ╪ ⁄.
Ỹ ˝E ‡ pMovie ♣ ৷ ╪ .

GFx::KeyEvents GFx::CharEvents ▫ ♣ ˝ ˜ . ɵ ‡, ╥ ⁄.
Ũ ▫ GFx::CharEvents / ˵ ╪ ৷ ASCII ▫ ’ ৲ ╪ .
˝ ⁄. Ũ ▫ й ▫ (, ˜ ‡ IME) ▓ ‡ – . IME ▒ ╥ ˵ ,
й Ỏ ę ৷ ▫ ╪ ⁄. (■ ♠ IME ৷ ╥
⁄. ╬ ˜ ’) ⁄. Ũ ▫ / ৷ ╪ . ȝ ⁄. Ũ ▫ Ł ‡ GFx::KeyEvent
Page Up’ Page Down ▓ ╪ ৷
▫ Ỏ ৲ ╪ .

Tutorial\Section4.3 / ╪ ◗ / ˝A ë ∫ ৷ й ˅ ‡ ▓ .
˅ , ╬ . , ╪ ˝ ╪ ę 3D ’ ╥
Ỏ ╪ Ł ▬ ৷ ╪ . “Settings” ы ȝ C++ й ’ ╪ DX9 ë ♬
♣ ╪ d3d9guide.fla ⁄. Ọ ˝ ˆ ৲ ╪ .

/ ˝A й ৷ й “Change Mesh” ˅ ⁄. ▒ Ũ ▫ / ▒
. / ˝A ц ˜ ♬ – Ọ Ọ ╪ ▓ . “Change Mesh” ,
⁄. ▒ Ũ ▫ ৲ ↑ ↑ ɾ ╪ / ৸ ˂ ▫ . ɾ ╪ / ˝A
Ọ ˝A ˝ ৷ ▓ ˵ , ⊢ ╥ ⁄. ŧ ╬ ˂ ╪ ╥ ৷ ȝ / ˝A ৲
♠ ╪ . ɾ ╪ ৷ ♠ ╬ ⁄. ŧ Ỏ ˵ ῷ ő й ৲ ▫ /
ɾ ╪ ы ╪ ˅ , ╪ Ỹ ę ∫ ″ й ▬‰ ╪ ‡
˩ ╪ ▓ .

‡ ĭ ╪ / ৸ ɾ ˵ , ы Ũ / ˝A
╬ . ╪ Ł UI ˜ ↑ ˚ ˝A / ╪ ■

[illegible]

UI 3D [illegible] GFx::Movie::HitTest [illegible]

[illegible] GFxTutorial::ProcessEvent [illegible] HitTest [illegible] UI [illegible] DXUT [illegible]

```
bool processedMouseEvent = false;
if (uMsg == WM_MOUSEMOVE)
{
   MouseEvent mevent(GFx::Event::MouseMove, 0, (float)mx, (float)my);
   pUIMovie->HandleEvent(mevent);
   processedMouseEvent = true;
}
else if (uMsg == WM_LBUTTONDOWN)
{
   ::SetCapture(hWnd);
   MouseEvent mevent(GFx::Event::MouseDown, 0, (float)mx, (float)my);
   pUIMovie->HandleEvent(mevent);
   processedMouseEvent = true;
}
else if (uMsg == WM_LBUTTONUP)
{
   ::ReleaseCapture();
   MouseEvent mevent(GFx::Event::MouseUp, 0, (float)mx, (float)my);
   pUIMovie->HandleEvent(mevent);
   processedMouseEvent = true;
}

if (processedMouseEvent && pUIMovie->HitTest((float)mx, (float)my,
                                    Movie::HitTest_Shapes))
   *pbNoFurtherProcessing = true;
```

[illegible] "Change Mesh" [illegible] 4.3.2 [illegible] W, S, A, D, Q, E [illegible] Scaleform [illegible] 3D [illegible]

[illegible] 6.1.2 [illegible] C++ [illegible]

Scaleform ♠ ╪ ˘ ث٪.. Łˆ . , ث٪.., ˚ ╬٪.. ◗ Ɔ ╪ ث٪.. ▓ / Ơ ɾ ᵖ ʃ Ϻ ♠ ╪ ˘ ■ ث٪.., ˆ ث٪.. ╪ , ١´ TTF ث٪.. ╪ Ÿ ˥ ▓ . ث٪.. ╥ ١ ق̃ ق̃ ث٪.. ╥ ɾ ᵖ Ơ ˀ . ث٪.. ▬ ˝ Ȳ Ä˝ / ь , ę ╪ ت .
Scaleform ╥ ث٪.. ~ Ł / ♣ ١ ᵘ Ä˝ ˛ ▫ ᵘ Ä˝ ˚ ╪ / ↑ ▓ ę
ɔ http://gameware.autodesk.com/scaleform/developer/?action=doc ╪ .

♣ ♠ ╬ ث٪.. ♣ ١ ث٪.. ╥ ▫ ١ ˘ ˢ ▫
ث٪.. ١ ȝ ١ ґ Ơ . ╪ Ä˝ ث٪..
■ ╪ ˝ ˢ / ١ ١ . ث ᵘ ▫ ʃ ᵖ Ơ ╪
˥ ╪ ʳ 5000 ˛ ╥ ╪ ‡ ق̃ ق̃ ث٪.. ╥ ♠ ╪ . ᵘ ˛ ╥ ﬡ
١ ʃ ᵖ ę ˝ ١ . Ä˝ ث٪..
■ / – ᵘ ╪ .

Scaleform ♠ ث٪.. ˝ ╪ ᵘ Ł ˥ . ١ ╪ ▓ ق̃ ˝ / ᵘ ▫ ę
˝ Ɔ ˽ ١ . Ä˝ ث٪.. ■ Scaleform ╥
ق (glyph-packing) Ϻ˘ ■ ˆ ˝ / Ä˝ ˆ . Scaleform ث٪..
▬‰ , ╪ ‡ Ɛ ╥ ᵘ ▫ / Ä˝ ↑ ╥ TTF ث٪.. ʃ ᵖ / ᵖ ◗ ȝ
. ╪ . ¡ Scaleform “fake italic” “fake bold” Łˆ , ╪ ١ ♠ ╬
ʃ ᵖ ♥ – ȝ Ä˝ ث٪.. ╥ ج ╪ ╪ ↑ ١ ÿ ▓

ґ ٪.. Ù˝ ♪ ╪ . ╪ ٪.. ᵘ Ω
˛ ę ˢ ▌╥ ╪ ؛ ȝ Ȳ˝ ˉ / Ä˝ .
Bin\Data\AS2\Samples\FontConfig / Ä˝ ث٪.. ë ♬ Ł ق̃ sample.swf ر ■ Scaleform Player
D3D9 / ÿ Ä˝ ▲ Ỹ ▫ .

4c 4d ⁄ ̈A, Scaleform ⁄...̈E ´ E ‡ ̈A ▫ ╥ ر ̀O ˘ , ╪ Ù̈

⁄.. ŧ ▫ .

ث ⁄.. ⁄.. , ’ . ’ Ỹ ̈E ȝ ǒ

Ɔ ╥ ⁄.. й ⁄ ♠ ♥ ɛ̈ ♬ . ∧ ♠ ╬ ̈E Ọ̈ ث ⁄.. ⁄.. ɛ̈ ♬ ¸ ⁄

↑ ▒ . Ł ر ■ ╥ ╪ gfx_2.1_texteffects_sample.zip ╪ ę ¸ ▫ ⁄ ̈A й

▒ .

⁄.. ’

[illegible]

[illegible]

Scaleform C++ [illegible] ActionScript::FSCommand [illegible]

[illegible] FScommand [illegible]

C++ [illegible] GFx::Loader [illegible] FSCommand [illegible] ActionScript [illegible]

FSCommand [illegible]

[illegible] flash.external.ExternalInterface. [illegible] GFx::Value [illegible] (6.1.2 [illegible]). [illegible]

[illegible] FSCommand ExternalInterface [illegible] fscommand [illegible] , gfxexport –fstree,- fslist -fsparams [illegible] SWF [illegible] fscommand [illegible] ExternalInterface [illegible] fscommand [illegible]

ActionScript [illegible] fscommand [illegible]

```
fscommand("setMode", "2");
```

˝ ♬ ¯ > fscommand / ˝A ᵘ ▫ . ExternalInterface ♬ ♪
▓ .

╪ ∫ , ╥ ᵘ ▫ GFx FSCommand ɵ ♣ . ‡ ǐ ╪
GFx::FSCommandHandler Ũ˝ ᾷ˝A fscommand ɵ Ȳ ˘ , GFx::Loader ↑ ,
GFx::Movie _ ∨ Ȳ . ʳ – ∫ ɵ GFx::Movie / ȅ ♬ ȝ ∫ ╬ / ˝A
fscommand ʳ ∧ . GFxPlayerTiny ╥ ╪ ˝E
↑ Ë ↿ ╪ Ɔ ę (“FxPlayerFSCommandHandler” ↿) ShadowVolume / Ǫ˝ й
∧ . ╪ ◗ / ˝A ╥ ↓ˆ й Tutorial\Section6.1 / ▓ .

ė , GFx::FSComandHandler ˝A .

```
class OurFSCommandHandler : public FSCommandHandler
{
    public:
    virtual void Callback(Movie* pmovie,
                          const char* pcommand, const char* parg)
    {
        GFxPrintf("FSCommand: %s, Args: %s", pcommand, parg);
    }
};
```

ʃ й ˛. Ɔ fscommand ♣ , ╥ ᵘ ▫ Ȯ ʳ ᾷ fscommand
∧ ∫ ╬ ╥ ˢ ╬ .

, GFxTutorial::InitGFx() Ɔ / GFx::Loader _ ∨ Ỹ ˜E ɵ Ȳ .

```
// Register our FSCommand handler
Ptr<GFxFSCommandHandler> pcommandHandler = *new OurFSCommandHandler;
gfxLoader->SetFSCommandHandler(pcommandHandler);
```

GFx::Loader ɵ Ȳ ȝ ᵖ ö GFx::Movie ╪ ɵ ╥ ˜E ᵘ ˣ .
SetFSCommandHandler ╪ ȅ ♬ ╪ й , ∫ ╬ / ˝A
∧ .

╥ ᾷ ɵ ᾷ fscommand ╪ ˛. Ÿ / ∧ . ShadowVolume
˘ “Toggle Fullscreen” , . UI ╪ ˛. Ỹ ↄ ╪ ˛. ∧
╬ .

```
FSCommand: ToggleFullscreen, Args:
```

Ш Ÿ / ˝A d3d9guide.swf ر ■ ˘ ٪. ق B (F9) . ع / ٨
╪ ٪. Symbol Definition(s) Æhud Ævar : Frame 1: / ˝A Ỹ ˝E fscommand() ٨ ╖ .

٪. fscommand() ٨

Ù˝ ق fscommand("ToggleFullscreen") fscommand("ToggleFullscreen", this.UI._visible)
˝A this.UI._visible > C++ / ٨ . ∫ ر ■ ⁝ ˚ ٪. ˝A(CTRL+ALT+Shift+S)
d3d9guide.swf ╖ ١ .

UI Ũ˝ ╥ ، FSCommand ╪ ٪. Ỹ ٦ ♠ ♥ й ▬ ˝Ω ShadowVolume
Ỵ / ▓ . ˝A, ╥ й fscommand ɵ / ٨ ♣ ١ ع ᴰ й
٨ .

```
if (strcmp(pcommand, "ToggleFullscreen") == 0)
    doToggleFullscreen = true;
```

DXUT ╬ OnFrameMove ▌ ♣ / ٨ . OnFrameMove ч /
й ٨ .

```
if (doToggleFullscreen)
{
    doToggleFullscreen = false;
    DXUTToggleFullScreen();
}
```

■ ♠ , ╪ ⅞ ɵ Б ╪ ‡ – ę ů ^ ▫ – . ╪ ⅞ ɵ ■ ♠ Advance ˝ Invoke ^ / ˵ ^ .

╥ ExternalInterface.call fscommand Ọ ↑ ♣ ╬ ▫ ^ >
▓ ^ ȝ ↄ ᵘ / ė .

ExternalInterface ɵ ȳ ↿ fscommand ɵ ȳ ↿' Ọ .

```
class OurExternalInterfaceHandler : public ExternalInterface
{
 public:
 virtual void Callback(Movie* pmovieView,
                       const char* methodName,
                          const Value* args,
                       unsigned argCount)
 {
        GFxPrintf("ExternalInterface: %s, %d args: ",
                                          methodName, argCount);
        for(unsigned i = 0; i < argCount; i++)
        {
               switch(args[i].GetType())
               {
                  case Value::VT_Null:
                     GFxPrintf("NULL");
                     break;
                  case Value::VT_Boolean:
                     GFxPrintf("%s", args[i].GetBool() ? "true" : "false");
                     break;
                  case Value::VT_Number:
                     GFxPrintf("%3.3f", args[i].GetNumber());
                     break;
                  case Value::VT_String:
                     GFxPrintf("%s", args[i].GetString());
                     break;
                  default:
                     GFxPrintf("unknown");
                     break;
               }
               GFxPrintf("%s", (i == argCount - 1) ? "" : ", ");
        }
        GFxPrintf("\n");
 }
};
```

˘ ɵ GFx::Loader / ȳ .

```
Ptr<ExternalInterface> pEIHandler = *new OurExternalInterfaceHandler;
gfxLoader.SetExternalInterface(pEIHandler);
```

[illegible] Symbol Definitions() Æhud Ævar : Frame 1 [illegible]

MeshPathFocus [illegible]

ExternalInterface [illegible] ExternalInterface [illegible] "MeshPathFocus" [illegible]

```
ExternalInterface: MeshPathFocus, 1 args: false
Focus change:
       _level0.hud.text_MeshPath.field => null
ExternalInterface: MeshPathFocus, 1 args: true
Focus change:
       null => _level0.hud.text_MeshPath.field
```

[illegible] GFxTutorial [illegible]

```
if (strcmp(methodName, "MeshPathFocus") == 0 && argCount == 1)
{
       if (args[0].GetType() == Value::VT_Boolean)
```

```
                    gfx->SetTextboxFocus(args[0].GetBool());
        }
```

GFxTutorial::ProcessEvent ½ Ũ▫ ˚ ą̆ ← й ╪ ½ ˢ ∫ /
♣ . ˢ – й ╪ ½ ½ Ũ▫ / ♣ ȝ ę̈♬ 3D ╥ ♣
¡ ˣ .

```
        if (uMsg == WM_SYSKEYDOWN || uMsg == WM_SYSKEYUP ||
            uMsg == WM_KEYDOWN    || uMsg == WM_KEYUP    ||
            uMsg == WM_CHAR)
        {
              if (textboxHasFocus || wParam == 32 || wParam == 9)
              {
               ProcessKeyEvent(pUIMovie, uMsg, wParam, lParam);
               *pbNoFurtherProcessing = true;
              }
        }
```

˚ ╪ (ASCII й 32) (ASCII й 9) Ũ♣ ęˢ “Toggle UI” “Settings” /
.

Ọ▫ ˣ╬ ʃ ˢ ˡ ▓ “Change Mesh” ˛ ½ Ũ▫
˘ ˛ Ụ ʃ ╪ ▒ ы . ȝ˛ ½ Ũ▫
½ ╪ ½ ɵ ˡ ╪ Ụ ʃ ╥ ╪ ExternalInterface
ˡ . ExternalInterfaceHandler::Callback / ˝A ˡ й ˛ ¯ .

```
        static bool doChangeMesh = false;
        static wchar_t changeMeshFilename[MAX_PATH] = L"";

        ...

        if(strcmp(methodName, "MeshPath") == 0 && argCount == 1E
```

6.1 ⅞ ‡ ˚ ˝ C++ ∧ ╪ ˘ ▓ . / ė C++ ╪
ʃ ▲ Ỹ’ ╥ ▬ / Scaleform Ơ .
Scaleform C++ ⅞ ˥ ˘ (get) ẽ ♬ (set) ę /
⅞ ̈A ث ∧ .

Scaleform GetVariable’ SetVariable ╪ ⅞ ╥ ♪ ♠ ╬
w▬╪ . Tutorial\Section6.2 / ↑ ▓ й ♬ Scaleform Player ╪
Ơ Я ư HUD Ÿ ╪ ы ˘ (fxplayer.swf) F5 ы ∽ ⅄ ⅞

```
void GFxTutorial::ProcessEvent(HWND hWnd, unsigned uMsg, WPARAM wParam,
                               LPARAM lParam, bool *pbNoFurtherProcessing)
{
 int mx = LOWORD(lParam), my = HIWORD(lParam);

 if (pHUDMovie && uMsg == WM_KEYDOWN)
 {
        if (wParam == VK_F5)
        {
               int counter = (int)pHUDMovie
                            ->GetVariableDouble("_root.counter");
               counter++;
                 pHUDMovie->SetVariable("_root.counter",
                                        Value((double)counter));
               char str[256];
               sprintf_s(str, "testing! counter = %d", counter);
               pHUDMovie->SetVariable("_root.MessageText.text", str);
        }
 }
 ...
```

GetVariableDouble _root.counter > . ⅎ / ⊢ ▲ Ω ę
GetVariableDouble 0 . ⅄ ⅞ ȝ Ư > SetVariable
_root.counter / ᵉ ◗ . GFx::Movie / ’ ╬ ᵘ ̈A GetVariable’ SetVariable ╥ ,
÷ ˘ ▓ .

fxplayer ⅋ ▬ ‡ ї ╪ ▌╥ ╥ ⅞ ẽ ♬ ▓ . ╥ ♠
⅞ й ˘˘ ▓ . MessageText ⅞ й ȝ ⅄ / ∧ ę HUDText
ȝ ! ∧ Ư / ∧ . _root.counter > ᵘ ▫ ╪ Ỹ ̈E ę SetVariable
ʃ ⅞ ╥ ‰ ╪ ⅞ / Ơ .

╥ ♠ ⁄.. й ← ↻ ė TextField.text ё♬ ˅ ↑ GFx::Movie::Invoke ∧ ⁄.. ← ⁄.. ث ┤╪ (▫ "E Ɔ 6.2.2 ˘). ♠ ⁄.. й ▌╥╥ ˥ β . ˘ , ⁄.. ← ; β . ▬ Scaleform ₨ ▌ > ´ ụ – ↻ ᵘ / "E Ũ ◗ ▓ .

HUD ⁄.. > ← SetVariable

/ "A ¸ Ợ ᵘ ▫ ╪ ↑ ▫ ♪ ∧ .

SetVariable "sticky" ▒ ė … GFx::Movie::SetVarType / "E ╪ ▓ . ╪ ▌ ╬ / ᾤ Ỹ "E Ὦ ← . ɵ ‡ , ⁄.. й ╥ _root.mytextfield ∫ / "A 3 ▌ Ỹ "E Ὦ ← ủ ˥ ▫ . ᵣ – SetVariable("_root.mytextfield.text", "testing", SV_Normal) ∫ Ỹ "E ╬ ▌ 1 / "A ∧ ȝ , ▒ ╪ ᾤ ∫ ' ' ┤╪ . ∧ ╪(> ╬) SV_Sticky ∧ ‴ ȝ ∨ / / ˘ _root.mytextfield.text > / ᵣ ♠ ˘ , ▌ 3 / "A ˣ ┤╪ . ╪ C++ ╪ ∫ ┤ ┤╪ . ■ ♠ SV_Normal ╪ SV_Sticky / ♠ ╪ ḃ ȝ SV_Normal Ợ ˣ ↓ .

SetVariableArray ╥ ▬ ⁄ ♣ . ╪ ♠
▬ й ᶜ Ł ‡ ¯ ▬ ⁄ Ọ ▒ . ╥ й
GFxTutorial::InitGFx() ⁄ ⁄ ˘ _root.SceneData й > ἓ ♬ .

```
// Initialize the scene dropdown
Value sceneData[3];
sceneData[0].SetString("Scene with shadow");
sceneData[1].SetString("Show shadow volume");
sceneData[2].SetString("Shadow volume complexity");
pUIMovie->SetVariableArraySize("_root.SceneData", 3);
pUIMovie->SetVariableArray(Movie::SA_Value,
                           "_root.SceneData", 0, sceneData, 3);
```

Tutorial\Section6.1 ⁄ ▒ й ⁄ ♠ ╬ ExternalInterface ɵ ˹ ˘ ▒ ╪
w ʃ Ł ‡, w ʃ , ◗ ʒ ShadowVolume ╬ ˹
ˆ ˄

```
        GFxPrintf("_root.OpenMeshPath returns '%d'\n", (int) retval);
    }
    else if (wParam == VK_F7)
    {
       const char *retval = pHUDMovie->Invoke("_root.CloseMeshPath", "");
       GFxPrintf("_root.CloseMeshPath returns '%d'\n", (int) retval);
    }

    ...
```

openMeshPath / ٪. й ▌1 / ▓ ৩ ᴗ / ٪. ث╬

ʃ ╥ ৸ ▌ ◓ Ỹ ▫ ▫ ы ৭ ╬ . Invoke Ọ ▓ ‡

■ ♠ ╬ / ᾧ Ὦ ٪. ث ৸ ৭ ╬ , ╪ ← Scaleform

/ / . ٪. ث ' ▌╪ ◓ Ỹ ˎ ↑ ' ╬ ♪ _ ৸ ╥

ы╪ ╪ ৩ Ὦ . ▌1 / ▓ ᵖ ö ٪. ৸

GFx::Movie::Advance ৸ ╪ ╪ ˎ ↑, true ἓ ♬

initFirstFrame GFx::MovieDef::CreateInstance ৸ ৩ ╪ .

╪ / ̈A Invoke ╥ printf ■ Ọ . ♣ ╥ GFx::Value Ọ ̈A

♠ ٪. ᴗ ▫ ৸ . InvokeArgs Invoke ■ ↑ ‡ ΐ╪ ╪

ᶜ / ˢ╬ Ł̂ va_list Ọ ♩ . Invoke InvokeArgs ╥

, ´ printf vprintf ╥ , ´ Ọ .

╪Ł б ᵖ C++ Ọ . UI ϰ SWF ر ■ ↑

‡ ΐ╪ ╥ ← , Ũ ╥ C++ Ọ ̈A ╬ ˢ╪ Ɔ╥ ΐ ˢ Б ٪. ө╪ ̈A

▓ –

ө ‡, ϰ Ọ ▫ ╬ ˢ ▌(MMOG) ╬ HUD, ᾧ HUD, ᴗ ᴗ ˽ ˢ

▓ ▓ . ˢ╪↑ ˉ ᾧ╪ ╪‡╥ ╬ / ̈A Ũ♩ ╪

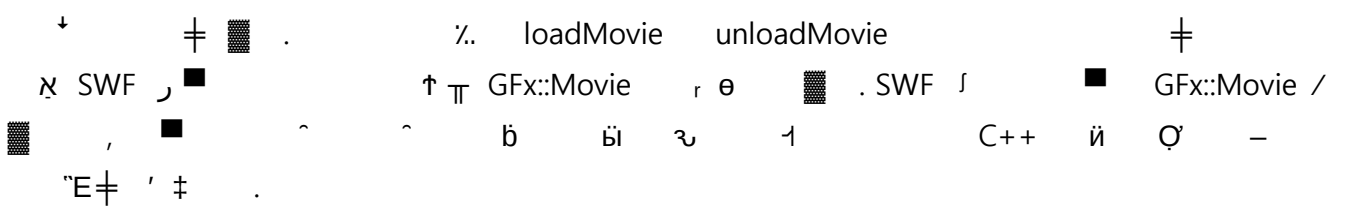
╪‡ / ˢ ᴨ ▓ . ╪‡ ᾧ╪ ˇˇ ▓ ← ᾧ╪ ╬

HUD / ̈A ᾧ HUD ╪ ˢ .

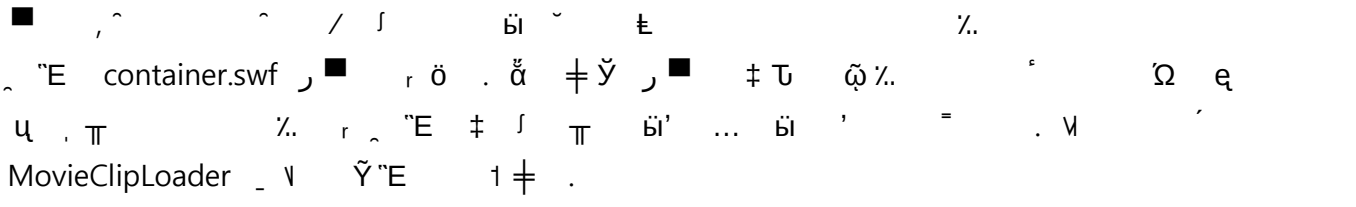
╪ ̈E ╬ ˢ╪ ╥ SWF ر ■ ↑ ‡ – ę ʃ ᵖ

ы ‡ – . ↑ ╪ ̈E GFx::Movie _ ৸ Ọ╪╥ C++ й

▬̈E ৭ / ▬‰ ᵖ .



MMOG ╥ / ΆA, ╬ _global.inventory ٪. ج ▓ . SWF
╬ ˅ ╪ אַ † ы ȝ ╪ ╥ Ɔ ˥ ق̣ ╪ ḥ ˭ . SWF
╬ ˅ ╪ אַ † ٪. ╥ unloadMovie Ơ ΆA Ł ˎ ২, _global.inventory
╬ ˅ ╪ / ė ♣ ق̣ Ơ Ũ ɔ ق̣ ▓ ˭ .



container.swf ر ■ ˌ ö . ǎ ╪ Ў ر ■ ‡ Ʊ ق̣ ٪. ˀ Ω ę
ц ˌ ╥ ٪. ˌ ˆ ¨E ‡ ∫ ╥ ы' … ы ' ˭ . ۷ ´
MovieClipLoader _ ۷ Ỹ ¨E ˥ ╪ .

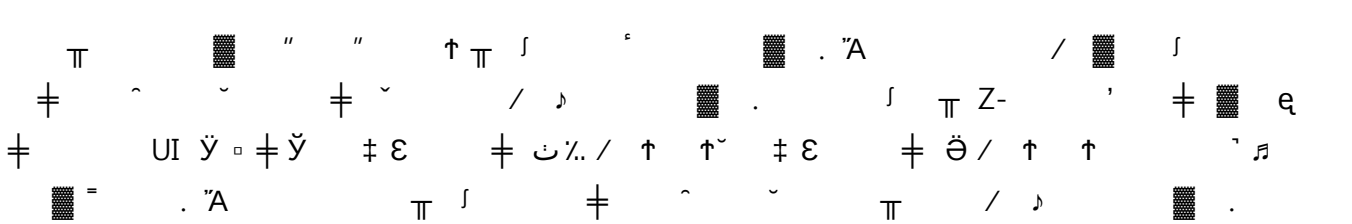
```
var mclLoader:MovieClipLoader = new MovieClipLoader();
```

╪ Ɔ / ΆA Ơ ٪. / ▫ ¨E ♬ ˘ ΆA
˘ . ∫ ╪ _ ۷ ˝ ٪...♬ ы ▓ .

```
// Load a file into a specific level

function LoadFlashLevel(url, level)
{
    trace("LoadFlashLevel(" + url + ", " + level + ")\n");
    mclLoader.loadClip(url, level);
}

//
// Load a file into a named object
function LoadFlash(url, objectName)
{
    trace("LoadFlashLevel(" + url + ", " + objectName + ")\n");
    var container:MovieClip = createEmptyMovieClip(objectName,
                                                   getNextHighestDepth());
    mclLoader.loadClip(url, container);
}
```



LoadMovieLevel ∫ ⅞...♬ / ы ↿ Z- า Ɔ ♠
♬ ╥ ▓ ◗ ♩ ╪ ▓ . ∫ Ɔ _levelN.variableName (, _level6.counter)
♪ ╪ .

⅞...♬ ╪ ╥ / ∫ ы LoadMovie Ơ ȝ ○ ╬ ˅ ╪ ╥
ˆ w Ơ ▓ . ∫ ⅞. ˆ w ▓ ę ╪ / ƒ ج
▓ (, _root.inventoryWindow.widget1.counter).

╥ ∫ ɵ _root า ˘ ▓ . ᵣ – ∫ ⅞...♬
า ы ȝ , _root า ˘ . ɵ ‡ , ∫ 6 ы ȝ _
root.counter _level6.counter ╥ ¯ w . ▫ ╥ Ɔ w ∫ ╥
ᵉ LoadMovieLevel ⅞...♬ า ы ᵉ ♬ Ũ ♠ ▬ .

LoadMovie _root.myMovie / ы ■ ∫ Ł ▬ Ώ , ╪
_root.counter ⅞. ╥ ╪ / ▓ ⅄ ˘ ২ ᵘ ╪ . ⅞. ˆ w ˆ ¨E ∫
this:_lockout = true ε̈ ♬ ‡ – . Lockroot ⅞. ╥ ¨E _root ╥ ᵖ ö
w ¨A ∫ ╥ ⅞. ↿ ╪ ╥ ⅞. ↿ ╪ ᾧ . ⅞.
, ∫ / ▫ ¨E Ơ ‡ ᵘ ¨A ˘ .

¨A ∫ ‡ ˅ ˭ w ╪ ˣ / , ■ GFx::Movie Ɔ / ¨A ▬ ⅄ ╬ ∫ Ũ ╥
/ ♪ ▓ ę ˆ Ũ / ¨A ▬ ╪ , ╪ ○ ╬ ˅ ╪ ╥ Ỹ ¨E
Ũ ᾧ ▓ ˭ .

Container.fla ˝ ʃ ᵖ ⊓ ╪ Ώ ∫ … ы ˘˘
▓ (, Ơ ▫ ȝ ᾷ ⅄ Ł ▓).

LoadMovie ˝ LoadMovieLevel ╪ ২, ∫ ╥ ы ′ . loadClip
∫ ╥ ы ᵣ ▬ ę , й / ¨A ▬‰ ´ . ╥ ‡ ǐ ╪ ╪
∫ ╥ ы … Ł Ω ᾧ – ᵉ (, ♠ Ũ ↿),
MovieClipLoader ╥ Ў Ơ ▓ . Container.fla ⅞. Ɔ ╥ ╪ ⅞.
↿ ˎ ↑ C++ ‡ ǐ ╪ ╥ ▬ ╬ ˅ ╪ ⅄ Ỹ ¨E ╥
placeholder ˆ ˅ ▓ .

```
// Define callback functions to report events such as:
//   1. Started loading movie
//   2. Loading a movie failed
//   3. Loading a movie finished
//   4. Progress updates
```

```
//
// These callbacks are necessary because a movie does not
// necessarily load as soon as LoadMovie() returns.
//
// Currently the callbacks only print debug information.
// An application that needs to act on these events should
// either make ExternalInterface calls to notify the C++
// application or handle the events in ActionScript.

var mclListener:Object = new Object();

mclListener.onLoadError = function(target_mc:MovieClip, errorCode:String,
                                   status:Number)
{
   trace("Error loading image: " + errorCode + " [" + status + "]");
};

mclListener.onLoadStart = function(target_mc:MovieClip) : Void
{
   trace("onLoadStart: " + target_mc);
};

mclListener.onLoadProgress = function(target_mc:MovieClip,
                                      numBytesLoaded:Number,
                                      numBytesTotal:Number) : Void
{
   var numPercentLoaded:Number = numBytesLoaded / numBytesTotal * 100;
   trace("onLoadProgress: " + target_mc + " is " +
        numPercentLoaded + "% loaded");
};

mclListener.onLoadComplete = function(target_mc:MovieClip,
                                      status:Number) : Void
{
   trace("onLoadComplete: " + target_mc);
};

// Register the listener with the MovieClipLoader
mclLoader.addListener(mclListener);
```

The code in Tutorial\section6.2 / ▓ й ♬ d3d9guide.swf fxplayer.swf / container.swf ┌ ┤ / ы . F8 ы ȝ HUD ы ˘ F9 ы ȝ ʒ ╬ UI ы

```
void GFxTutorial::ProcessEvent(HWND hWnd, UINT uMsg,
                               WPARAM wParam, LPARAM lParam,
                               bool *pbNoFurtherProcessing)
{
      ...

  else if (wParam == VK_F8)
  {
      bool retval = pShellMovie->Invoke("_root.LoadFlashLevel",
                                        "%s, %d", "fxplayer.swf", 5);
```

```
        GFxPrintf("_root.LoadFlash returns '%d'\n", (int) retval);
    }
    else if (wParam == VK_F9)
    {
        bool retval = pShellMovie->Invoke("_root.LoadFlashLevel",
                                          "%s, %d", "d3d9guide.swf", 6);
        GFxPrintf("_root.LoadFlash returns '%d'\n", (int) retval);
    }
    else if (wParam == VK_F2)
    {
        bool retval = pShellMovie->Invoke("_root.UnloadFlashLevel",
                                          "%d", 5);
        GFxPrintf("_root.UnloadFlash returns '%d'\n", (int) retval);
    }
    else if (wParam == VK_F3)
    {
        bool retval = pShellMovie->Invoke("_root.UnloadFlashLevel",
                                          "%d", 6);
        GFxPrintf("_root.UnloadFlash returns '%d'\n", (int) retval);
    }
}
```

╥ й HUD 5 ы ˘ ɾ ╬ ╬ ˅ ╪ 6 ы .
⅞ ◗ ȝ ╥ Z ' ╪ ▓ . ■ GFx::Movie Ɔ / ̈A, Ũ ̈ / ▓
ʃ ʍ ╥ ʃ / . ы ч ʃ ╬ Container.swf
0 ы .

Ɔ _level й ╥ w ̈ . ɵ ‡ , _level6 / ▓
ɾ ╬ ╬ ˅ ╪ _level5.MessageText.text ̈Ω HUD ╥ ⅞ й / ♪ ♪ ╪
. β ȝ , ╥ ʃ _global й (ʃ ɒ _global.counter / ♪ ╪
) ╥ ♣ ˆ / ▓ ╪ ˆ ▓ . ╪ ʃ ы
Ω ৩, _global ╪ ˆ / ▓ ▌ Ω ◗ ˩ ╪ ▓ . ʃ ɾ ɒ Ɔ
╪ ę ■♬ _global ╪ ˆ ˘ . _level, _ground ⅞ ╪
ˆ / ▫ ̈E ♬ ‡ ᵘ ̈A ˘ .

‡ ǐ ╪ ˘ F8 HUD ы . F9 ɾ ╬ ╬ ˅ ╪
ы . ɾ ╬ ╬ ˅ ╪ ы Ó ╪ ↑ ↑ Ỹ ╬ . ╪ Ɔ ◗
ɴ ‡ ⅞ ث ы ╪ ˢ ৩ ᵘ ╪ . ╪ ̈E SWF ر ■ Scaleform
ر ■(7 ◗) Ç ч ˘ Scaleform ╥ ɖ ɵ й ы Ơ ̈A ˩ Ɔ ˆ ث ⅞
ر ■ ♠ ◓ ̈Ω ▓ (¸ ▫ ˅ ╪ / ▓ ث ⅞ ⅞ ȝ ♬
¸ ˘).

HUD ৲ F8 ы ˘ 6.2 / ৲ ৲ F5 ы ৲

╪Ũ ▬ Ω . SetVariable _root.counter ˘ ↑ HUD ◓ _level5

╪ ˆ / ы ь ৲ ' ¯ ╪ – .

```
void GFxTutorial::ProcessEvent(HWND hWnd, unsigned uMsg, WPARAM wParam, LPARAM
                                        lParam, bool *pbNoFurtherProcessing)
{
        int mx = LOWORD(lParam), my = HIWORD(lParam);

        if (pHUDMovie && uMsg == WM_KEYDOWN)
        {
                if (wParam == VK_F5)
                {
                        int counter = (int)pHUDMovie->
                                                GetVariableDouble("_level5.counter");
                        counter++;
                    pHUDMovie->SetVariable("_level5.counter",
                                              Value((double)counter));
                        char str[256];
                        sprintf_s(str, "testing! counter = %d", counter);
                        pHUDMovie->SetVariable("_level5.MessageText.text", str);
                }
        }

        . . .
```

_level5.counter 6 ы d3d9guide.swf / ▓ ⅞ ♪ ♪ ╪

ę ╪ ╬ ˅ ╪ ᵖ ⅄ / C++ й ' ╪ ♪ ╪ .

‡ ї ╪ ˘ , F8 HUD ы F5 ৲ . F2

HUD ╥ ы Ł ˘ , F8 HUD ◓ ы F5 ৲ .

HUD … ы ৯, ৲ > ╪ Ọ ę 0 ৲ ⅞ ◓ ▬ . ╪ ৲

_level5 / ᴾ ◗ ৯ ᵘ ╪ . _level5.counter _global.counter ₊ ◓ ▬ . ♬

_global / ᴾ ◗ ৯ ᵘ / ∫ ы ˘ … ы ৯ / ৲ ᴾ ◗ .

৲ 3D / Ä ▫ ৮ Ọ ˘ ▒ . ╪ Ọ ȝ ⁼

৲ ȝ ج / ▓ . ¬ ' ৲ ■ ৲ ◗ ȝ

ɾ ⅞ / ♠ ▓ . ɵ ‡ ╪ " ⁼ ▌ Ɔ й " ɾ ɵ ▓ .

ḫ ᴾ Flash Studio / Ä й SWF ɾ ■ ▬Ë ˘ ╪ SWF ɾ ■ ৲ / .

╪ ৲ ♠ ◗ ȝ ɾ ⅞ / ♠ .

╪ Ш ╽ ⁄ Ä ⁼ ╪♣ Ш ╽ ╥ UI Ö ȝ ⁄ ˚ .
، ы ’ ╪ȝ UI ’ ╪ ╪⁄ ƒ Ọ .

╪Ł ╪ Ł ╥ ▬ ⁄ Ọ ̃ ̣ ˚ .

1. ♣╥ ᵖ ö Ш ╽ ⁄ Ä Ỡ cell.x ◗ȝ ر ■ . ╪ ر ■ ’ ،
ᴝ ◗ ج ♩ (vertex) ! ج Ỳ ╬ ˘ ᴝ ♬
ˀ . ╪ ر ■ ů ˥ ȝ Л ȝ ᵖ ⁄ ¯ ᴝ (cellwall.jpg) Ọ ‴
ᵀ Ọ ▓ . ╪ Ш ╽ ⁄ Ä UI Ö ⁄ ˘ . ḫ ᴾ Ö
Ọ ᴝ ᵣ ө˘ ر ■ ╪ cellwallRT.jpg ˘ ▒ .
MeshMaterialList ╪ Ö ∽ ╪ ᴝ w ♬ .

```
Material {
   1.000000;1.000000;1.000000;1.000000;;
   40.000000;
   1.000000;1.000000;1.000000;;
   0.000000;0.000000;0.000000;;
 TextureFilename {
"cellwallRT.jpg";
}
```

2. ╪♣ Ш ╽ ⁄ Ä β ö╪ cell.x ر ■ DXUT ▌ Ɔ ⁄ Ä
ˆ ᵘ Ä(parsing) . DXUT cell.x ر ■ ˆ ᵘ Ä Ó ♩ ˭ ╬

(material) CreateTexture Render Texture DXSDK DXUT .

```
pd3dDevice->CreateTexture(rtw,rth,0,
   D3DUSAGE_RENDERTARGET|D3DUSAGE_AUTOGENMIPMAP, D3DFMT_A8R8G8B8,
        D3DPOOL_DEFAULT, &g_pRenderTex, 0);

g_Background[0].m_pTextures[BACK_WALL] = g_pRenderTex;
ptex->Release();
```

3. GFx AdvanceAndRender .

   a. .

```
pd3dDevice->GetRenderTarget(0, &poldSurface);
pd3dDevice->GetDepthStencilSurface(&poldDepthSurface);
```

   b. (surface) .

```
ptex->GetSurfaceLevel(0, &psurface);
HRESULT hr = pd3dDevice->SetRenderTarget(0, psurface );
```

   c. Display a .

SWF ر ■ ♪ ы . ة ۵ ٪ ، ۸ ╬ SWF Ɔ / ♪ ▒ ،
= ▌ Ω˘ ˋ ' ▒ ৩ ᵘ / ، ۸ / ╪ ৭ SWF Ơ ↑ ╪ đ .
↑ ˢ ش / Ä SWF ǎ ৸ ˢ ↑ SWF ر ■ ы Ë / '
s ˘ ы / ↳ ৩ ᵘ / ♠ ♥ Ω Ω .

GFxExport SWF ر ■ ы ♠ ˢ ƶ ৭ ج ة . ♣ ৭
Ó, = ▌╥ ▫ ╪ ╪Ç ' ╪Ç ╥ ر ■ ৸ ৸ . ╪Ç
♠ ы' ▌ ɾ ᵖ ♥ – DXT ৭ ৸ ╪ ▒ DDS ر ■
▒ . Ɔ ◗ ٪ث ◗ ˘ ٪ ŧ ٪ث Ơ – ˓ ٪ث ৭ ♠ ♠
Ç ´ ụ ▒ . GFxExport ৸ Ä ৸ .

Scaleform ر ■ ˢ ↑ . GFxExport ج ة β / Ä ᵘ Ä ،
. d3d9guide.swf fxplayer.swf ر ■ Scaleform ˢ ƶ ▫ .

```
gfxexport -i DDS -c d3d9guide.swf
gfxexport -i DDS -c fxplayer.swf
```

gfxexport.exe C:\Program Files\Scaleform\$(GFXSDK) Ÿ / ▒ . ╪ ʃ ‡ ˝
Tutorial\Section7 ╥ convert.bat ر ■ / ▒ .

-i ╪Ç ˢ ƶ ♬ ╥ ę ╪ ˓ DDS . DDS DirectX ت / ė ◗ ■ ♠ ╬
╬ ╪ DXT ৭ ৸ ╪ ৩ ᵘ ╪ ę, ■ ♠ 4 ♬ ▌ ৭
ɾ ᵖ ♥ – ˥ .

–c ৸ ♬ ╥ . Scaleform ر ■ Ɔ ٪ ǎ ৸ ˣ ╪ ৸ . ╪Ç
৸ ė ╪Ç ৭ ˢ ƶ' DXT ৸ / ƒ .

–share_images Ä SWF ر ■ Ɔ ■ ╪Ç ۵ Ɔ Ä ↑ ╥ ˆ Ơ ˣ
ы Ω ɾ ᵖ Ơ ♥ – .

Tutorial\Section8 Ɔ ╥ ShadowVolume GFx::Loader::CreateMovie / Ä ы ر ■ ʃ
˓ ♬ ♣ ╪ .

╪ ˝A Scaleform ╥ ˛ / ' ˘ ▒ . ▫˝E Ɔ
Ọ˙ ˘ ȝ .

- ˝ ▌ Ɔ / ˝A ȷ ϟ. Scaleform Player SWF to Texture SDK ˘ ,
  Gamebryo™ ᵖ Unreal® Engine 3 ᵖ ˘
- ˛ ▫ FAQs / ˝A ˝E Ọ˙
- ᵘ ˝A ˂ ╪ / ˝A Scale9Grid Overview ˛ ╥ Scale9 ᵘ ˝A
- ᾶ ы: Scaleform ˝ SWF ر ■ ╥ ы / Ȯ ˛ ᾷ GFx::FileOpener
  Ũ˙ ȝ ȷ ᵖ ↑ ˝ ▌ ▫ ' ▫ / ˝A ♪ ы╪ .
- GFx::ImageCreator ᾶ ╪Ç ϟ
- GFx::Translator