

GfX Audio Support Overview

This document outlines the audio support included with Scaleform GfX 3.0 and higher versions.

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1 Introduction

Scaleform® GfX™ 3.0 and higher provides full audio support for playing Flash® sound files through a custom sound renderer interface based on the cross-platform FMOD™ sound library. Embedded audio files and external files loaded from ActionScript can be played in GfX. The audio files can be of various formats such as WAV, MP3 etc. Sounds from video files can also be played with the default sound renderer. Additionally, developers can utilize their own sound library using the sound renderer interface implemented in GfX. Please note that it will be the customers' responsibility to obtain appropriate FMOD and MP3 licenses.

Using embedded Flash audio may be more suitable for casual games or games which are primarily Flash based. It is also useful for prototyping screens and allows artists to quickly iterate on the look and feel of a User Interface (UI) without requiring a game engine or final audio pipeline in place. For larger game development, a more common solution is to play audio through triggered events and handle the events using the game's native audio engine. This allows the same audio pipeline, sound engineers, file packing and resource management system to be used for both UI audio and in-game sounds. GfX allows for this type of solution by providing a standard event-based, Flash sound interface for FMOD/ Designer and Wwise®/SoundFrame, see the section below on Sound Event Interface for more details.

GfX 2.2 and lower versions do not have audio support and developers should play sounds using their own sound library through the `fscommand()` callback. Simply define a little `fscommand` based sound interface, such as `fscommand("Sound.Play", "filename.wav")`, `fscommand("Sound.SetVolume", "volume")`, etc to play audio files.

2 Sound System Initialization

To initialize the GfX sound system, an instance of the GfXAudio state class should be set on the GfXLoader object. The purpose of this state is to provide the sound renderer object, GSoundRenderer and the synchronization parameters for playing Flash streaming sounds. The GSoundRenderer class is an abstract C++ interface, which should be implemented in the game to produce the sound. GfX provides the default implementation, which is based on the FMOD cross-platform sound library and can be used on all supported platforms.

Example:

```
GSoundRender* pSoundRender = GetSoundRender();
if (pSoundRender)
{
    // Sound renderer and parameters for playing SWF streaming sounds
    // are provided to the loader by GfXAudio. These parameters
    // control when and how the synchronization between SWF frames
    // and sound frames should be done.
    GPtr<GfXAudio> pAudioState = *new GfXAudio(pSoundRender);
    Loader.SetAudio(pAudioState);
    pSoundRender->SetMasterVolume(SoundVolume);
    pSoundRender->Mute(IsMute);
}
```

This sound system initialization is only required for embedded Flash audio support. If you are using the Sound Event Interface instead, with Wwise or your own sound engine, this step is not required.

Please refer to the source code of GfXPlayer and to the Flash sound example for details.

3 Video Sound System Initialization

If a video file has audio data, then an instance of the GfxVideoSoundSystem interface should be set on the GfxVideo object for initializing the video playback system. Gfx provides implementations of this interface on each supported platform based on GSoundRenderer interface.

Example:

```
GSoundRenderer* pSoundRenderer = GetSoundRenderer();
if (pSoundRenderer)
{
    // Setting a video sound system instance which is based on
    // GSoundRenderer interface
    pVideo->SetSoundSystem(pSoundRenderer);
}
```

Example:

```
// Setting a video sound system instance which is specific to
// a particular platform
pVideo->SetSoundSystem(
    GPtr<GfxVideoSoundSystem>(*new GfxVideoSoundSystemDX8(0)));
```

Please note that the SetSoundSystem() method should be called only once per an instance of GfxVideo.

4 Sound Event Interface

GFx 3.2 adds an event-based, Flash sound interface for FMOD/ Designer and Wwise®/SoundFrame (GSoundEvent::PostEvent and GSoundEvent::SetParam). This new interface allows sound playback to be easily triggered from within ActionScript and played back using the GFx Flash player or a game engine sound system.

Four implementations are included in GFx distribution:

1. GSoundEventFMOD - based on FMOD Ex API.
2. GSoundEventFMODDesigner - based on FMOD EventSystem API and supports the FMOD Designer tool.
3. GSoundEventWwise - based on Wwise API.
4. GSoundEventWwiseSF - supports the Wwise SoundFrame tool protocol.

Example:

```
#include "GSoundEventWwise.h"
GPtr<GSoundEvent> soundEvent = *new GSoundEventWwiseSF;

soundEvent->PostEvent("GFxSound_PostEvent", "Play_Hello");
soundEvent->SetParam("GFxSound_SetParam", "Enable_Effect", 85);
```

Please refer to the source code of GFxPlayer, to the implementation of sound event interfaces and to Flash sound example for details.

5 Video Sound System Interfaces

GFxVideoSoundSystem is an abstract interface providing sound support for video (GFxVideo) playback; developers can substitute the video sound implementation by making their own version of this class. Before playing video, an instance of this class needs to be created and installed with `GFxVideo::SetSoundSystem()`. Typically, a platform-specific implementation can be used to avoid implementing this interface.

Following are the platform-specific sound system interfaces included in GFxVideo distribution:

- GFxVideoSoundSystemDX8 – DirectSound for Windows.
- GFxVideoSoundSystemXA2 – XAudio2 for Windows and Xbox360.
- GFxVideoSoundSystemPS3 – MultiStream for PS3.
- GFxVideoSoundSystemWii – Wii system sound.
- GFxVideoSoundSystemFMOD - sound interface based on FMOD.
- GFxVideoSoundSystemWwise – sound interface based on Wwise.

In the current version of GFx, video sound support is decoupled from the embedded Flash sound playback, allowing video to be used without requiring the general sound engine. To make this work, video is supported by an independent GFxVideoSoundSystem class that is separate from GSoundRenderer used in the rest of GFx. This means that to get video sound support, GFxVideoSoundSystem and GFxVideoSound class only need to be implemented, which are much simpler than GSoundRenderer. Note that if you already have GSoundRenderer implementation, you can use it directly to initialize GFxVideo, as it provides a superset of functionality. In some cases, the two implementations can be mixed (helpful if a custom video sound class provides better streaming support than the general sound engine).

Example:

```
#include "GFxVideoSoundSystemXA2.h"
pVideo->SetSoundSystem(
    GPtr<GFxVideoSoundSystem>(*new GFxVideoSoundSystemXA2(0, 0)));
```

For video sound support, GFxVideoSoundSystem and GFxVideoSound need to be implemented. Typically there is only one instance of GFxVideoSoundSystem installed during video initialization. GFxVideoSoundSystem exposes a single method, `Create`, used to create GFxVideoSound objects representing independent video sound streams. GFx will call this function every time a new video is opened (there can be multiple videos playing at the same time). After each GFxVideoSound object is created, GFx will call its various functions to instruct it to `Start` and `Stop` audio output. The actual sound data for the stream is obtained through polling of the `GFxVideoSound::PCMStream` passed to

the given sound. Polling is typically done by a separate thread maintained by the GfXVideoSoundSystem to service its active sounds.

Please note that the current implementation of GfXVideoSoundSystemWwise based on Audio Input plug-in is available as part of Wwise SDK since v2009.2.1 build 3271. Audiokinetic provides the full source code and the Visual Studio solutions/projects of this plug-in can be found at *SDK\samples\Plugins\AkAudioInput*. Please refer to Wwise documentation for details. GfX Video distribution does not include any part of the Wwise SDK which should be installed separately.

Example:

```
#include "GfXVideoSoundSystemWwise.h"

GPtr<GfXVideoSoundSystem> wwiseSound =
    GPtr<GfXVideoSoundSystem>(*new GfXVideoSoundSystemWwise());
pVideo->SetSoundSystem(wwiseSound);
wwiseSound->Update();
```

Please refer to the source code of GfXPlayer and to the implementation of video sound system interfaces for details. Also, see the [Getting Started with Video](#) document for information on playing videos.

6 Sample Source Code

Please refer to the following files for more details on implementing the sound renderer.

- GfxPlayer source code, FMOD/Wwise initialization:
 - Apps\Demos\FxPlayer\FxPlayer.cpp
 - Apps\Demos\Common\FxSoundFMOD.cpp
 - Apps\Demos\Common\FxSoundWwise.cpp
- Sound renderer implementation based on FMOD:
 - Src\GSoundRenderer\GSoundRendererFMOD.h
 - Src\GSoundRenderer\GSoundRendererFMODImpl.cpp
- Sound event interfaces FMOD/Designer and Wwise/SoundFrame:
 - Src\GSoundRenderer\GSoundEventFMOD.h
 - Src\GSoundRenderer\GSoundEventWwise.h
- Video sound system interfaces implementation:
 - Src\GFxVideo\GFxVideoSoundSystem*.cpp
- Flash sound example:
 - Bin\Samples\Sound_sample.flc

7 Additional Resources

Please refer to the below documents for additional information on the CRI Movie codec for playing video files, the ActionScript extensions used in playing the sound files, and the options for exporting the SWF into desired formats.

- [Adobe Flash ActionScript 2.0 Language Reference](#)
- [Scaleform GFx - Flash Support Overview](#)
- [Getting Started with Video](#)
- [CRI Movie Encoder Command Line Tool Overview](#)
- [GFxExport Reference Guide](#)