FMOD PROFILER

USER MANUAL

http://www.fmod.org

LEGAL NOTICE

INTRODUCTION TO PROFILER

The FMOD Profiler tool allows a user to connect to an FMOD Ex application and monitor its resource usage. The profiler connects to the application in the same way as the network audition functionality.

In use, the Profiler can also be used to identify which DSP effects are active in the FMOD DSP network during the application's execution. It is possible to identify the complete signal path of a waveform through to the soundcard. The profiler may also be used to monitor the overall CPU usage as well as the CPU usage of each DSP node. Finally the profiler can also monitor the codec pool and channel usage.

Note: The Profiler tool will only identify processing in the software domain. Any processing through hardware channels, or OpenAL will not be shown.

GETTING STARTED

INITIALISATION OF FMOD EX (PROGRAMMER)

Before the Profiler can view the DSP network or monitor resource usage, the FMOD Ex engine (running in the target application) must be correctly initialized using the flag:

```
FMOD_INIT_ENABLE_PROFILE
```

For example, initializing FMOD Ex (using the low level API) to enable profiling, would look something like:

```
result = pSystem->init(32, FMOD_INIT_NORMAL | FMOD_INIT_ENABLE_PROFILE, 0);
```

PROFILING APPLICATIONS

Before running the profiler, please ensure:

▸ FMOD Ex (System or EventSystem) is initialized using the flag FMOD_INIT_ENABLE_PROFILE
▸ The target game (or application) is running, and it's IP address is noted

STARTING THE PROFILER

To run the profiler, complete the following steps:

1   Run the Profiler executable. This file will be found under the 'tools' subdirectory of your FMOD Ex Programmer API directory.

2   In the 'IP text box, enter the IP address of the target game (or application). For example, if the game is running on the same machine as the Profiler tool, you would enter 127.0.0.1.

3   If the default port number is not being used, enter the port number into the 'Port' text box.

4   Press the 'Connect' button. The tool will attempt to connect to the target game.

5   When connected the DSP network of the target game will be displayed and the CPU usage of the DSP network will start monitoring.

Note:

The connection status message (found in the top left hand corner of the profiler) may contain the warning 'Old DSPNet version detected'. This message is displayed when the profiler is using 'compatibility' mode – usually when the profiler version is connected to an earlier version of the FMOD Ex API.

When this message is displayed, some functionality of the profiler may not be available, as the client is no sending the required data.

UNDERSTANDING THE DSP NETWORK

Once the tool has connected to the FMOD Ex DSP network, it draws each node and the connections between them. On the next page is an image of a simple DSP network.

The output from the soundcard can be traced back to the input by reading from left to right. On the far left is the 'Soundcard' unit. The soundcard then pulls data from the 'FMOD ChannelGroup Target Unit', which pulls data from a master group, reverb and channels, etc.

Active DSP network nodes are identified with a light-blue background. Inactive DSP network nodes, such as paused sounds or virtual voices are identified with a dark gray background. Nodes that are bypassed are displayed with a light gray (or silver) background.
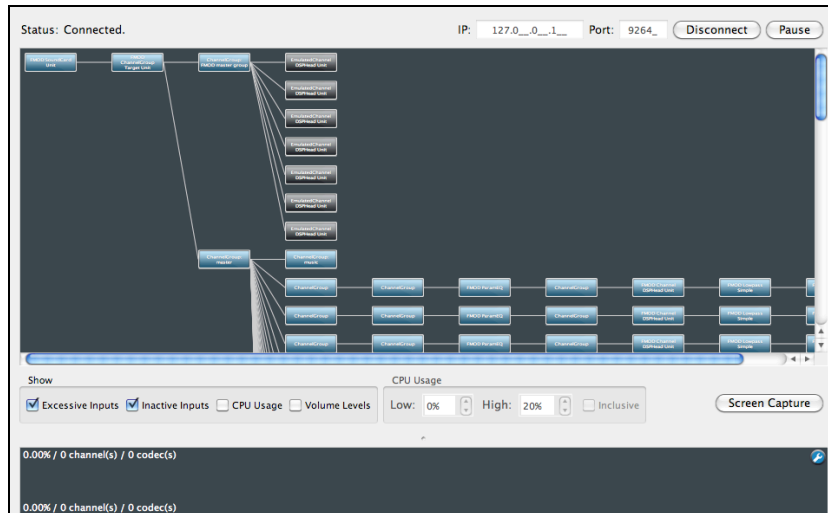
▲ Figure 1: A DSP network

MONITORING CPU USAGE PER NODE

By clicking the 'CPU Usage' checkbox in the 'Show' panel, the profiler will display the CPU usage of each node on the DSP network. Clicking the 'CPU Usage' checkbox will also enable the 'CPU Usage' panel for use.

When active, each node will fluctuate between the following colors:

‣ **Green** – This means the node is using a low amount of CPU time.
‣ **Yellow** – This means the node is using a moderate amount of CPU time.
‣ **Red** – This means the node is using a large amount of CPU time.

Rather than assign fixed CPU usage values as low, moderate and high, the profiler tool allows the user to specify the color behavior using the 'CPU Usage' panel.

‣ The 'Low' field value represents the CPU usage at which the node remains as green.
‣ The 'High' field value represents the CPU usage time at which the node flagged as red.

Any CPU usage between the 'Low' and 'High' values will produce a gradient value between green and red (generally a tone of yellow).

This feature effectively allows the user to identify any high CPU usage of a node within the DSP network.
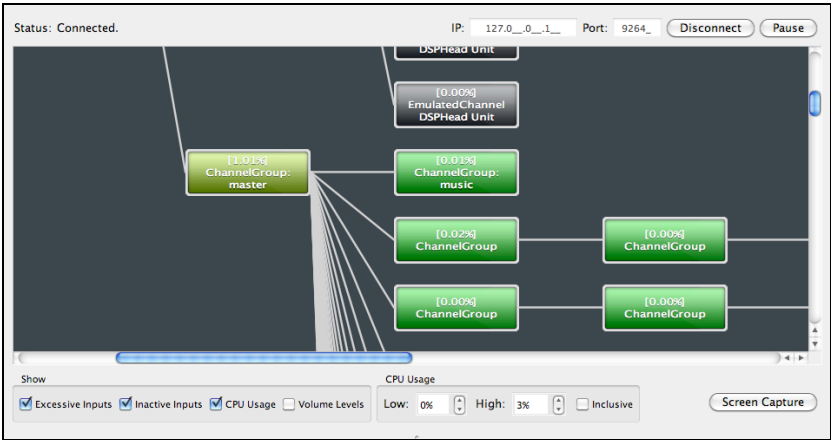
▲ Figure 2: Monitoring CPU usage per node

INCLUSIVE MODE

The 'Inclusive' mode makes any CPU intensive nodes more visible to the user, by propagating a visually effect to nodes further along the DSP network. This allows the user to trace a path from right to left to find the offending node.

Within the 'CPU Usage' panel there is a checkbox labelled 'Inclusive'. When the 'Inclusive' mode is enabled, CPU usage values for each node are summed with the node (or nodes) connected to the left.
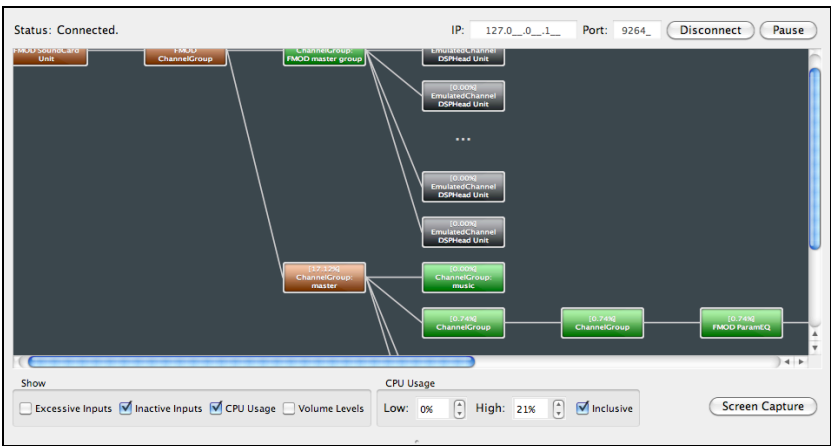

▲ Figure 3: Effect of the Inclusive mode

MONITORING VOLUME PER NODE

The profiler allows users to monitor the signal volume at each node. The volume monitor is intended as a diagnostic tool to find issues within the DSP network and indicate clipping where possible.

To enable this feature, click the 'Volume Levels' checkbox. Enabling volume monitoring causes a peak meter for each channel in the signal path (above the node) to be displayed. The Profiler queries all nodes each FMOD update cycle and determines the signal's peak value for each channel. Using this data, the volume meter displays the following colors:

‣ **Green** – This means the sample value is under maximum. The height of the green bar indicates the amount of headroom remaining.

‣ **Red** – This means the signal has clipped maximum output.
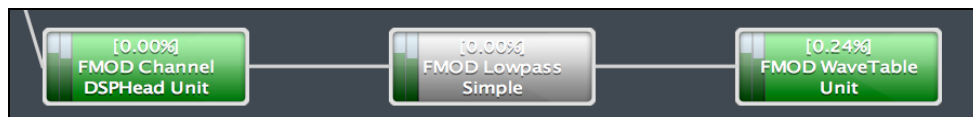
▲ Figure 4: Enabling volume level monitoring

OTHER DSP NETWORK FEATURES

SAVING

To save the current state of the DSP network, the tool can create a screenshot. The 'Save' button, produces a .PNG image of the complete DSP network (and is not affected by the current zoom level).

To use this feature:

1 Press the 'Screen Capture' button. A dialog window should appear.

2 Enter the desired filename and location of the image file.

3 Press 'OK'. The image file will be created.

ZOOMING

The Profiler allows the user to inspect nodes in closer detail or view all nodes at once, using the zooming function. The feature requires a mouse with a scroll wheel facility.

To zoom in (for close viewing) roll the scroll wheel up. The zoom out (for distant viewing) roll the scroll wheel down.

HIDING INPUTS

The checkbox labeled 'Excessive Inputs' is useful when dealing with complex DSP networks which contain many nodes. When deselected, the number of child nodes displayed under any node will be limited.

The checkbox labeled 'Hide Inactive Inputs' allows any inputs not is use to be ignored, and not displayed in the DSP network tree.

USAGE MONITORING

The profiler tool allows users to monitor CPU, mixer channel and codec pool usage. This display is located below the DSP network panel.
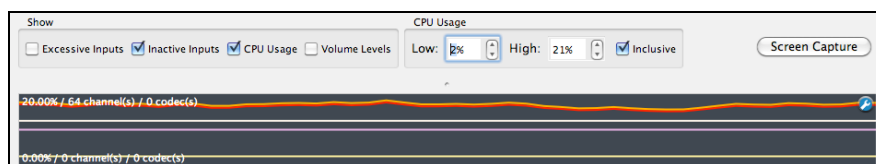
▲ **Figure 5: Resource monitoring**

SELECTING AN ITEM TO MONITOR

To select the resource to monitor:

1 Press the ⊘ button on the graph panel. This will cause the 'graph control' dialog to appear.

2 Navigate through the three tabs and click on the checkboxes to be displayed in the graph. Each item is explained in the section below.

3 To stop the monitoring of an item, simply click the item checkbox again.

CPU MONITORING

Within this panel, the user can monitor the CPU usage in real time. The following data can be displayed:

‣ **DSP**
    o Identifies the CPU usage on the DSP network. This includes mixing and DSP effects.

- **Stream**
  - o Identifies the CPU usage of the streaming engine. This CPU overhead is incurred whenever sounds are streamed from disk.
- **Geometry**
  - o Identifies the CPU usage of the Geometry API thread.
- **Update**
  - o Identifies the CPU usage of the processing undertaken in the **System::update(..)** or **EventSystem::update(..)** method of the source code. This includes calculations for 3D behavior, occlusion and envelopes.
- **Total**
  - o The total amount of CPU usage. **Note:** The total percentage may exceed 100% in some circumstances, such as systems that feature multiple CPUs and when the mixer thread does not receive adequate resources.

MIXER CHANNEL MONITORING

Within this panel, the user can monitor the mixer channel usage in real time. The following data can be displayed:

- **Hardware**
  - o Displays the number of hardware channels being mixed by the soundcard hardware.
- **Software**
  - o Displays the number of software channels being mixed by the software mixer.
- **Real**
  - o Identifies the number of channels in playback (hardware + software channels).
- **Virtual**
  - o Identifies the number of channels that are active, but currently inaudible (virtual).
- **Playing**
  - o Displays the total number of channels being mixed. This includes all active sounds that have a real channel, and those which are virtual.

CODEC POOL USAGE

Within this panel, the user can monitor the codec pool usage in real time. The following codecs can be displayed:

- **MPEG**
  - o Displays the number of MPEG codecs currently being played.
- **ADPCM**
  - o Displays the number of ADPCM codecs currently being played
- **XMA**
  - o Displays the number of XMA codecs (Xbox 360 only) currently being played.

- ‣ **PCM**
  - o Displays the number of PCM codecs (PS3 only) currently being played.

CHOOSING THE RANGE TO DISPLAY

By default, the profiler will maximize the display scale by dynamically adjusting the 'Maximum' value to highest value measured by the profiler.

The display scale can be fixed to a selected value by:

1 Pressing the ⊘ button on the graph panel. This will cause the 'graph control' dialog to appear.

2 Navigating to the appropriate tab (CPU, Channel or Codec).

3 Entering the desired range maximum into the 'Maximum: ' textbox field

The display range will be indicated by the values in the bottom left and top left corners of the graph panel.